

USATHAMA

U.S. Army Toxic and Hazardous Materials Agency

Jefferson Proving Ground

**South of the Firing Line
Health and Safety Plan
Volume IV**

September 1992

**Prepared for:
U.S. Army Toxic and Hazardous Materials Agency
Aberdeen Proving Ground, Maryland 21010-5401**

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Distribution unlimited approved for public release.

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Abbreviations and Acronyms

ACGIH	American Conference of Government Industrial Hygienists
CFR	Code of Federal Regulations
CPR	cardiopulmonary resuscitation
DEMO	demilitarization
DU	depleted uranium
EEDs	electrical explosive devices
EMM	earth-moving machinery
EMR	electromagnetic radiation
EO	explosive ordnance
EOD	explosive ordnance disposal
EODT	EOD Technology, Inc.
FEV/FVC	pulmonary function test
H&S	Health and Safety
HEAT	high explosive anti-tank
JPG	Jefferson Proving Ground
LEL	lower-exposure limit
MSDSs	Material Safety Data Sheets
NIOSH/MSHA	National Institute for Occupational Safety and Health/Mine Safety and Health Administration
OEW	ordnance explosive waste
OSHA	Occupational Safety and Health Administration
PCBs	polychlorinated biphenyls
PCP	pentachlorophenol
PELs	permissible exposure limits
PID	photoionization detectors
PPE	personal protective equipment
ppm	parts per million
PZ	piezoelectric
RF	radio frequency
SCBAs	self-contained breathing apparatus
SECD	SEC Donohue, Inc.
semi-VOCs	semi-volatile organic compounds
SHSO	Site Health and Safety Officer
SHSP	Site Health and Safety Plan
SMAC-23	blood serum general chemistry
SOP	Standard Operating Procedures
SWMU	solid waste management unit
TCE	trichloroethylene
TECOM	U.S. Army Test and Evaluation Command
TLD	thermoluminescent dosimeter
TLVs	threshold limit values
USATHAMA	U.S. Army Toxic and Hazardous Materials Agency
UXO	unexploded ordnance
VOCs	volatile organic compounds
WBGT	wet bulb globe temperature index
WP	white phosphorus

1.0 INTRODUCTION

1.1 Policy/Purpose

It is the policy of SEC Donohue, Inc., (SECD) to provide a safe and healthful work environment for all of its employees. SECD considers no phase of operation or administration to be of greater importance than injury and illness prevention. Safety takes precedence over expediency or shortcuts, and every attempt is made to reduce the possibility of injury, illness, or accident occurrence.

The purpose of this Site Health and Safety Plan (SHSP) is to assign SECD personnel health and safety responsibilities, to prescribe mandatory operating procedures, and to establish personal-protective-equipment (PPE) requirements for job, work, or activity for alternative and contingency work items, emergency response, and spill cleanup and abatement. It is the responsibility of Jefferson Proving Ground (JPG) to determine whether to adhere to these guidelines and recommendations as "authorized visitors" and to provide their personnel with the appropriate PPE. These actions will allow the safe and successful performance of tasks associated with JPG. In the event JPG personnel decide not to adhere to these guidelines and recommendations, SECD will not be held responsible for injuries or damages sustained as a result of that decision.

This SHSP complies with all applicable Occupational Safety and Health Administration (OSHA) regulations and is in accordance with SECD Health and Safety Policies and Procedures. A copy of this SHSP will be made available at each work location.

The provisions of this plan are mandatory for all SECD personnel and SECD subcontractors assigned to this project. All authorized visitors to any of the work sites will be required to abide by SECD policy and procedures. Work conditions can be expected to change as the operation progresses. As appropriate, written addenda to the plan will be provided by SECD Health and Safety (H&S) or the Site Health and Safety Officer (SHSO). No changes to this plan will be implemented without prior approval of the Project Manager, Health and Safety Officer and the Program Manager.

1.2 Site Background, History, and Description

JPG occupies 55,265 acres of land along U.S. Highway 421, north of Madison, Indiana. Portions of JPG are located in Ripley, Jennings, and Jefferson Counties. The installation is approximately 18 miles long (north-south) and 5 miles wide (east-west). Most of JPG is wooded, with clear areas surrounding the building complexes and airport. The non-wooded areas north of the firing line are located at high-impact target areas. The topography of JPG is flat to rolling, with most relief due to stream incision. Surface-water drainage is generally from the northeast to the southwest, and consists of seven streams and their tributaries.

JPG is a test center of the U.S. Army Test and Evaluation Command (TECOM). The mission of JPG is to plan and conduct production-acceptance tests, reconditioning tests,

surveillance tests, and other studies of ammunition and weapons systems (including system components). The buildings, roadways, and fixtures have been built to meet the requirements of the primary mission of JPG.

JPG has been used as a testing ground for ordnance since its purchase in 1940. A wide assortment of munitions and ordnance have been tested at JPG, including propellants, mines, ammunition, cartridge cases, artillery projectiles, mortar rounds, grenades, tank ammunition, bombs, boosters, and rockets.

Past and present activities at JPG have resulted in the detonation, burning, and disposal of many types of waste propellants, explosives, and pyrotechnic substances at the site. Physically hazardous materials consist mainly of explosive ordnance (EO), which is spread over most of the area north of the firing line and portions south of the firing line. The hazardous wastes consist of explosives, (e.g., trinitrotoluene), waste propellants, lead, chlorinated solvents, wood preservatives, sulfur, silver, photographic-development wastes, sanitary wastes, and petroleum products. Some of these wastes are known to have been released into the soil, with subsequent migration into groundwater, and others are suspected of migration into groundwater and surface water. The past and present environmental-assessment programs have not included extensive sampling and analyses of soils and/or water. Most studies have been very limited in scope, dealing with a small area of the facility, or with a particular solid waste management unit (SWMU).

1.3 Potential On-Site Contaminants and Permissible Exposure Limits

The SHSO will conduct conventional industrial-hygiene monitoring when, in the judgment of the SHSO, an activity may produce airborne concentrations of particulates, gases, fumes, or mists in excess of accepted safe limits. Monitoring must also be done to document that working levels are safe and employee exposure is at an acceptable level. The data will be compared with the American Conference of Government Industrial Hygienists (ACGIH), threshold limit values (TLVs), and OSHA permissible exposure limits (PELs). In addition, monitoring will be done to document that working levels are safe and employee exposure is at an acceptable level. The most restrictive exposure limit will be enforced. Random monitoring for contaminants will be conducted in identified areas. If this activity reveals any reason to believe that accepted safe limits are in question, SECD personnel will evacuate the area and notify the JPG Chief of Safety.

A list of potential on-site contaminants and their exposure limits, which were obtained from previous data reports compiled from work at JPG, are shown in Table 1.

Exposure to these chemical hazards may occur through inhalation, dermal absorption, or accidental ingestion of the contaminant. Inhalation could occur during operations that may generate airborne mists, vapors, or gases. Control measures will be implemented to control any potential uptake or absorption when handling these chemicals. Where control measures are not feasible, respiratory protection will be used. Inhalation of volatile or semi-volatile

Table 1. Potential On-Site Contaminants and Exposure Limits at JPG

<u>Contaminant</u>	<u>OSHA Permissible Exposure Limit</u>	<u>ACGIH Threshold Limit Value</u>	<u>Absorbed Thru Skin</u>	<u>Known or Suspected Carcinogen</u>
Antimony Sulfide	0.5 mg/m ³	0.5 mg/m ³	No	No
Arsenic	0.5 mg/m ³	0.2 mg/m ³	Yes	Yes
Asbestos	0.2 f/cc	0.2 f/cc	No	Yes
Atrazine	5 mg/m ³	5 mg/m ³	No	No
Beryllium	0.002 mg/m ³	0.002 mg/m ³	No	Yes
Bromacil	1 ppm	1 ppm	No	No
Cadmium	0.2 mg/m ³	0.05 mg/m ³	No	Yes
Chromium	1 mg/m ³	0.5 mg/m ³	No	No
Copper	1 mg/m ³	1 mg/m ³	No	No
2,4 Dichlorophenoxyacetic acid	10 mg/m ³	10 mg/m ³	Yes	No
2,4 Dinitrobenzene	1 mg/m ³	1 mg/m ³	Yes	No
2,4 Dinitrotoluene	1.5 mg/m ³	1.5 mg/m ³	Yes	No
2,6 Dinitrotoluene	1.5 mg/m ³	1.5 mg/m ³	Yes	No
HMX	*N.E.	*N.E.	Yes	No
Hyvar X-L	1 ppm	1 ppm	No	No
Lead	.05 mg/m ³	0.15 mg/m ³	No	No
Lead Styphnate	*N.E.	*N.E.	Yes	No
Lead Mononitroresorcinat	0.15 mg/m ³	0.15 mg/m ³	Yes	No
Lead Azide	.15 ppm	.15 ppm	Yes	No
Mercury	.05 mg/m ³	.05 mg/m ³	Yes	No
Mercury Fulminate	0.05 mg/m ³	0.05 mg/m ³	Yes	Yes
Nickel	0.1 mg/m ³	0.1 mg/m ³	No	Yes
Nitrate	*N.E.	*N.E.	Yes	Yes
Nitroglycerin	.05 ppm	.05 ppm	Yes	No
Nitroguanidine	*N.E.	*N.E.	No	Yes
Pentachlorophenol	0.5 mg/m ³	0.5 mg/m ³	Yes	No
Phosphorus (Yellow)	0.1 mg/m ³	0.1 mg/m ³	No	No
RDX	1.5 mg/m ³	1.5 mg/m ³	Yes	No
Selenium	0.2 mg/m ³	0.2 mg/m ³	Yes	No
Tetracene	*N.E.	*N.E.	Yes	No
2,4,5 Trichlorophenoxyacetic acid	10 mg/m ³	10 mg/m ³	No	No
1,3,5 Trinitrobenzene	1 mg/m ³	1 mg/m ³	Yes	No
2,4,6 Trinitrophenyl	0.1 mg/m ³	0.1 mg/m ³	Yes	No
2,4,6 Trinitrotoluene	0.5 mg/m ³	0.5 mg/m ³	Yes	No
U235 and U234	2X10 ⁻¹¹ µCi/ml	2X10 ⁻¹¹ µCi/ml	No	Yes
U238	3X10 ⁻¹² µCi/ml	3X10 ⁻¹² µCi/ml	No	Yes

*PELs/TLVs Not Established

Note.—The above exposure limits were obtained from OSHA, ACGIH, and U.S. Army Documents.

chemicals may occur during invasive operations, which may allow these compounds to be released into the air. Dermal absorption or skin contamination with potentially hazardous-chemical compounds is possible. Contamination-avoidance procedures, good personal hygiene, and chemical-protective clothing will be used to minimize this risk. The potential of accidental ingestion of potentially hazardous chemicals is considered to be low with adequately trained personnel.

1.4 Physical Hazards

The hazards associated with this project include the physical risks associated with chemical-handling activities, heat stress, extreme cold, excessive noise levels, and flammable atmospheres.

Engineering controls (e.g., guarded moving parts) shall be used to control the physical hazards present during operations. Protective equipment shall also be used to minimize these hazards.

Wearing chemical-protective clothing poses potential heat-stress hazards. Work practices and procedures to monitor and control heat stress will be followed.

Excessive noise levels may be generated from air compressors, heavy-construction equipment, and the test firing of ordnance. Noise levels will be evaluated using a sound-level meter. Worker-noise exposure will be accomplished using noise dosimeters. Hearing protection will be worn by all employees working in noise levels of 85dBa or greater.

Drilling or digging near combustible sources may encounter or generate flammable atmospheres. Monitoring for explosive limits and oxygen deficiency will be conducted using a combustible gas/oxygen meter.

Other physical hazards associated with the JPG site are as follows:

- Utilities, overhead power lines, energized electrical systems, and pressurized equipment.
- Unexploded ordnance (UXO).
- Uneven terrain and heavily wooded areas with fallen trees.
- Truck and vehicular traffic.
- Tornadoes and possibly surface-stream flooding.
- Snakes (copperheads and timber rattlesnakes) and insects (chiggers and ticks).
- Deer (a vehicular traffic concern).
- Poison oak and poison ivy.

1.5 Site-Specific Hazards

Personnel conducting field work may be subject to UXO when working at JPG. Common-sense measures, such as screening work areas and notifying personnel of unidentified objects

will be implemented. EOD Technology (EODT), SECD's UXO subcontractor, will screen intrusion points for UXO prior to actual intrusion and during the intrusive activity.

JPG personnel from the Demilitarization (DEMO) Department will clear (to the extent possible) areas for UXO prior to work activities being conducted in these areas. A full-time JPG employee will be assigned as an escort while activities are being conducted at JPG.

Any SECD or SECD-subcontractor employee entering any impact areas must notify Range Control/JPG Safety prior to entering these areas. The full-time JPG escort will have a mobile radio available for this purpose.

2.0 ASSIGNMENT OF RESPONSIBILITIES

All SECD and subcontractor employees, who are involved in JPG operations, are subject to this SHSP.

All personnel is responsible for continuous adherence to the safety procedures during the performance of the work. In no case may work be performed in a manner that conflicts with the intent of or the inherent safety and environmental cautions expressed in these procedures. After due warning, personnel who violate safety procedures will be dismissed from the site and may be terminated. All field personnel shall be properly trained in Health and Safety regulations associated with handling hazardous materials and the safe operation of equipment. All personnel will be trained as necessary according to the specifications set forth by 29 CFR 1910.120 and this document.

For this project, health and safety oversight will be accomplished by the SHSO, Cecil Morton. He will provide oversight of personnel to ensure coordination/liaison with the JPG personnel, adherence to the work plans, and implementation of this SHSP.

2.1 Project Organization

2.1.1 *Health & Safety*

The SHSO will be responsible for implementation and coordination of the general SHSP and any addenda. This plan will comply with established site-specific procedures in all respects and will include medical surveillance, training requirements, hazard assessment, personal-protective equipment, field implementation, and audits. The SHSO will update and change this plan if warranted by changed conditions and with the approval of the U.S. Army Toxic and Hazardous Materials Agency (USATHAMA) Safety and Environmental Services Branch, Program Manager, and Manager of Health and Safety.

2.1.2 *Project Manager*

The Project Manager will be responsible for field implementation of the SHSP and all health and safety-related matters. This responsibility will include communication of site requirements to all personnel, field supervision, and consultation with the SHSO regarding appropriate changes to the SHSP. The Project Manager will be responsible for informing the SHSO of any changes in work plans so that they may be appropriately addressed.

2.1.3 *Technicians/Subcontractors*

Technicians, subcontractors, and other personnel on-site will be responsible for understanding and complying with all site requirements. All applicable H&S requirements will be included in subcontracts. The written requirements will be copied and distributed to personnel working on-site, and individuals receiving the written requirements will be required to sign off as having received and understood the document.

3.0 MEDICAL PROGRAM

3.1 Medical Services

Site personnel will obtain medical services through King of Daughters Hospital under most conditions (telephone number: 812-265-5211). JPG has emergency support services and will provide treatment and stabilization for life-threatening conditions. The primary point of contact for emergency medical support at JPG is through the U.S. Army Health Clinic, Building 33 (Phone: 13 or 7127).

3.2 Physical Examinations

As required by SECD policies and procedures, all personnel on-site will have successfully completed a preplacement or periodic/update physical examination. This examination has been designed to comply with OSHA 29 CFR 1910.120 requirements for hazardous-waste-site operations.

The SECD Medical Program complies with OSHA 29 CFR 1910.120, and consists of the following:

- Medical and Occupational History Form (detailed for new employees, short for periodic exams).
- Physical examination.
- Complete blood count with differential.
- Blood serum general chemistry (SMAC-23).
- Heavy-metal screening.
- Urinalysis (dipstick and microscopic).
- Chest X-ray.
- Pulmonary function test (FEV/FVC).
- Audiogram.
- Electrocardiogram.
- Visual acuity.

All subcontractor employees who have potential for exposure to hazardous materials shall have successfully completed an examination similar to the preplacement physical. The cost for medical surveillance will be paid by the subcontractor. All physicals will be approved by a physician who can demonstrate experience in occupational medicine. The physician will issue a fitness-for-duty medical certificate for all personnel on-site.

3.3 Medical Certifications and Personnel-Exposure Monitoring Records

Medical certifications and personnel-exposure-monitoring records will be maintained in accordance with the requirements of 29 CFR 1910.20 and will be kept for 30 years by SECD. Employee confidentiality will be maintained. The local medical provider will be

advised to hold exposure- monitoring records in keeping with federal regulations and SECD policies.

3.4 Injury and Illness Treatment

A local physician familiar with occupational medicine will be identified prior to the field work as part of the mobilization task. The name and contact number of the selected physician will be posted on-site. The physician will be familiar with effects of chemicals on-site and will be used as a consultant in the event of a job-related illness.

If an injury/illness is the result of a chemical exposure, the Field Supervisor shall identify the chemical(s) through the use of monitoring equipment (i.e., photoionization detectors (PID) in conjunction with detector tubes and/or conventional industrial-hygiene monitoring) and any prior sampling will be made available to the treating physician.

Any injury/illness not limited to a first-aid response requires that the Field Supervisor notify the SHSO as soon as possible. This notification allows the coordination of internal resources to assist the treating physician in rendering appropriate care. Any injury/illness must be reported in person to the Chief of Safety, Allen Dunham (extension 7257).

Accidents resulting in a fatality, lost-time injury or illness, hospitalization of five or more people, or property damage to government or contractor property (which occurred during the performance of the contract) equal to or exceeding \$2,000.00 must be telephonically reported to USATHAMA, CETHA-TS-S, (410) 671-4811, as soon as possible, but not later than 2 hours after occurrence and reported in writing within 5 days of occurrence on ENG Form 3394 (see Appendix E). All other accidents/incidents must be telephonically reported to USATHAMA, CETHA-TS-S, (410) 671-4811 within 8 hours of occurrence. In case of an accident requiring immediate medical attention, notify the U.S. Army Health Clinic, Building 33. For an Ambulance, call extension 13.

Any SECD or subcontractor employee who is suspected of having sustained overexposure to the chemicals on-site will be given another physical examination. Any employee or subcontractor who develops a lost-time illness or sustains a lost-time injury will be reexamined. The physician will certify that the employee is fit to return to work by completing a "Physician's Recommendation for Return to Work." If necessary, activity restrictions will also be specified on the "Physician's Recommendation to Return to Work."

All incidents involving personnel or property will be reported in accordance with SECD incident-reporting procedures.

4.0 TRAINING PROGRAM

All potential safety hazards at the site will be discussed, and individuals will receive instructions on the requirements of the SHSP. Training will include familiarity with Material Safety Data Sheets (MSDSs), which will be available for each contaminant. MSDSs for site contaminants are located in the Safety Office, Building 100. This training will be designed to address the requirements of OSHA Hazard Communication Standard (29 CFR 1910.1200) and the OSHA Hazardous Waste Operations and Emergency Response Standard (29 CFR 1910.120). In addition, SECD and all contractor/subcontractor personnel performing work activities at JPG are required to attend a 30-minute safety-training session conducted at JPG by the Safety Department. This training includes familiarization with the JPG Safety and Emergency Procedures.

4.1 Pre-Project Training

All employees and contractors who work on-site shall have successfully completed a formal 40-hour OSHA-training program that will include:

- **Basic Safety Training.** This course stresses fundamentals, such as the cause and prevention of slip, trip, and fall hazards; safe lifting techniques; and heat/cold stress illnesses.
- **Hazard Protection.** This course deals with the identification, recognition, and safe-work procedures for toxic material. The use and limitations of applicable protective clothing and decontamination procedures are an important part of this course.
- **First Aid and Cardiopulmonary Resuscitation (CPR).** At least one of the employees will have completed the standard Red Cross First Aid and CPR courses.
- **Health Hazard Awareness.** Information will be available concerning on-site hazardous materials to which employees may be exposed. The information will include routes of exposure, toxic effects, appropriate protective equipment, medical surveillance, and the specific nature of jobs that could result in exposure to chemicals on-site.
- **Work Practices and Engineering Controls** to minimize risk.
- **Hearing Conservation Program** as defined in the training program.
- **Respirator Training.** The use, limitations, and inspection of air-purifying respirators and self-contained breathing apparatus (SCBAs) will also be covered. Respirator-fit tests will be given to all personnel. These tests will consist of a qualitative fit using irritant smoke in a plastic containment structure or equivalent.

Each employee will also have received 3 days of on-the-job site-specific training and a minimum of 40 hours of initial off-site instruction. On-site supervisors shall have completed at least 8 additional hours of specialized training on managing hazardous-waste operations. This training includes familiarization with the JPG Safety and Emergency Procedures.

4.2 Tailgate-Safety Meetings

Daily Tailgate-Safety Meetings will be conducted at the beginning of each shift or whenever new employees or contractors arrive at the job site once the job begins. At these meetings, health and safety considerations and the necessary protective equipment for the day's activities will be discussed. Compliance with state, local, and installation motor vehicle laws will be emphasized at each daily safety meeting, as well as any special hazardous-driving conditions. This meeting will be conducted by the SHSO or his designee and documented on a Training Attendance Sheet. Each employee present will be required to sign the Training Attendance Sheet.

4.3 Material Safety Data Sheets

Complete MSDSs (or Chemical Data Sheets) will be available at the JPG site for those chemicals known to be present with sufficient information to assess their health hazards. MSDSs may be required in the event of discovery of additional chemicals on-site. This information will be presented at the next safety meeting. MSDSs will also be provided for materials brought on-site by SECD and subcontractors for use during field work. A copy of these MSDSs will be made available to the JPG Safety Department.

4.4 Training Records

All training that is conducted on-site will be documented on the Safety Meeting Form and retained in the project file.

5.0 MONITORING

5.1 Area Monitoring

Area air monitoring will be conducted by the SHSO with direct reading instruments for explosive limits, oxygen, and volatile organic compounds (VOCs). Monitoring for explosive limits and oxygen deficiency is to be conducted using a combustible gas/oxygen meter. Monitoring is to be conducted using an industrial scientific continuous-monitoring instrument that alarms at <19.5 percent oxygen, >25 percent oxygen, and 10 percent lower-exposure-limit (LEL). Monitoring for VOCs will be accomplished using a PID. White phosphorus (WP) will be monitored using a gas-chromatography instrument, or colormetric tubes (manufactured by Draeger). A daily health and safety (i.e., air-monitoring) log shall be maintained by the SHSO. The log shall include the following information:

- Description of the field work being conducted.
- Any changes in the operation.
- Names of all personnel working at the site.
- Types of air-monitoring equipment being used, and how calibrations were performed.
- Results of air monitoring.
- Level of PPE being worn.
- Any accidents and/or injuries.
- Description of any unusual occurrences or physical complaints.

Copies of the logs shall be provided weekly to USATHAMA, CETHA-TS-S, during field activities. It is acceptable to submit facsimile copies to CETHA-TS-S at (410) 671-1675.

Air-monitoring instruments will be checked routinely, and any alarms or readings greater than one-half of the PEL will be recorded and documented in the SHSO's log book. A copy of this log will be provided to the Program Manager.

Action Levels:

(Area) Oxygen	<20 percent
(Area) Particulate	Visual determination by the SHSO
(Area) Flammable Atmospheres	> 10 percent of the LEL (Area)
Breathing Zone (VOCs)	> 1 ppm

If action levels are equaled or exceeded, work will stop immediately and personnel will move 200 feet upwind and let the area vent for a minimum of 5 minutes. At the end of the 5-minute waiting period, air-quality measurements will be taken. If concentrations have not been reduced below action levels, continue venting until it does. If the breathing-zone readings exceed 10 parts per million (ppm), the level of protection will be reevaluated. At no time will work continue without respiratory protection if any of the Section 1.3 PELs or TLVs are equaled or exceeded.

Any observation of airborne particulate by the SHSO will require corrective measures, either respiratory protection, dust control, or work stoppage.

In extreme cases, a particular operation may be delayed and restarted under new working H&S guidelines, or work may be abandoned completely. No one shall enter any confined space such as tanks, underground vessels, rail cars, etc., without first having the atmosphere checked for the percentage of oxygen and for combustibles or any other suspected contaminants. In any case, such entries require that a Confined Space Entry Permit be obtained by the SHSO from the JPG Chief of Safety.

5.2 Personnel-Exposure Monitoring

Personnel-exposure monitoring will be provided during all activities conducted in contaminated areas. Results will be used to assess exposures and govern PPE. Compounds monitored include all identified contaminants, particulates, gases, vapors, and heat/cold stress. Access logs will be maintained and daily-exposure tracking will be performed by the SHSO.

Conventional Industrial Hygiene monitoring will also be conducted when, in the judgment of the SHSO and with concurrence from the Program Manager, an activity may produce airborne-contaminant concentrations in excess of acceptable safe limits.

Noise surveys will be conducted using a hand-held sound-level meter. If readings greater than 85 dBa are encountered, hearing protection will be issued and worn.

Actual exposures will be based on the time spent in contaminated areas. All personnel will be required to sign in and out of areas on an access/egress log. These data will be compared with ACGIH TLVs and OSHA PELs. The effects of these compounds will be considered as additive, and TLVs will be computed as such.

All personnel-exposure-monitoring records will be maintained for a period of 30 years and retained by SECD in accordance with 29 CFR 1910.20.

5.3 Radiological Monitoring

Radiological-contamination monitoring will be conducted using alpha-, beta-, and gamma-detection instrumentation. All activities conducted in the Depleted Uranium (DU) area will require a contamination survey of personnel and equipment prior to exiting the DU area. Any contamination detected above the release limits of 1,000 dpm/100cm² removable and 5,000 dpm/100cm² fixed alpha and 750 dpm/100cm² removable and 3,500 dpm/100cm² beta/gamma will require decontamination prior to exiting the DU area. All personnel working the DU area will be required to wear a thermoluminescent dosimeter (TLD) for external-exposure monitoring. In addition, personnel-breathing-zone air samples will be collected to assess any possible internal exposure from airborne radioparticulates, if conditions warrant and at the discretion of the SHSO.

All monitoring equipment will be maintained and calibrated/source checked daily. These data will be recorded in the SHSO logbook. Specific instrumentation information and surveying procedures are located in Appendix G of this HASP.

6.0 PERSONAL PROTECTIVE EQUIPMENT AND PROCEDURES

6.1 Standard Procedures

The majority of the tasks performed at JPG will consist of Levels C and modified Level D PPE. Where Levels C are not required, the following will be used as criteria for establishing levels of PPE to be worn; however, the minimum PPE on-site is hard-toe safety shoes, hard hat, and eye protection.

If the action levels specified in Section 5.1 are exceeded, respiratory protection may be required. Therefore, the following standard procedures need to be understood by all on-site personnel:

- The respiratory protection utilized on-site will be in compliance with OSHA, 29 CFR 1910.134.
- Only properly cleaned, maintained, National Institute for Occupational Safety and Health/Mine Safety and Health Administration (NIOSH/MSHA)-approved respirators (half-face, full-face, or positive air-pressure units) shall be used on-site.
- Selection of respirators, as well as any decisions regarding upgrading or downgrading of respiratory protection, will be made by the SHSO.
- Air-purifying cartridges shall be replaced at the end of each shift or when load up or breakthrough occurs (i.e., when breathing becomes difficult or odors are detectable).
- Only employees who have had pre-issue qualitative fit tests and annual fit tests thereafter will be allowed to work in atmospheres where respirators are required. Fit-test documentation will be kept as part of each employee's training-documentation records. The employee must also have medical certification on file. Personnel working with asbestos are required to be fit tested every 6 months.
- If respiratory protection causes the employee to experience difficulty in breathing when performing the fit test or during use, he or she will not be allowed to wear respiratory protection until the individual can be evaluated by a physician.
- No employee shall be assigned to tasks requiring the use of respirators if, based upon the most recent examination, a physician determines that the employee will be unable to function normally wearing a respirator or that the safety or health of the employee or other employees will be impaired by use of a respirator.
- Air-supplied respirators shall be assembled according to manufacturer's specifications regarding hose length, couplings, valves, regulators, manifolds, etc.

- Facial hair (e.g., beards) prohibits proper face fit and effectiveness of respirators. Persons required to wear respirators must not have beards, etc. All personnel wearing full-face or half-face respirators will be required to be clean shaven prior to each day's shift.
- Regular eyeglasses cannot be worn with full-face respirators. If eyeglasses are required, a mask-fit kit will be made available with prescription lenses.
- SCBA will be utilized when air concentrations exceed the protection factor of air-purifying respirators.

6.2 Protective Clothing

Protective clothing will be determined based on site-specific chemical and physical hazards. For stream and well sampling, Level C, Modified Level D, or Level D protective clothing is required. For staging and handling, Level D is required. These levels of protective clothing comprise the following:

- Level C
 - Non-permeable, hooded, chemical-resistant Saranex suits.
 - Silver-Shield nitrile outer-glove with 6.5 mil vinyl inner-glove.
 - Neoprene boot/shoe covers.
 - Full-face respirator with combination chemical and particulate cartridge.
- Modified Level D
 - Non-permeable, hooded, chemical-resistant Saranex suits.
 - Silver-Shield nitrile outer-glove with 6.5 mil vinyl inner-glove.
 - Neoprene boot/shoe covers.
- Level D
 - 6.5 mil vinyl sampling gloves.
 - Steel-toed footwear with neoprene covers.
 - Hard-hat and safety glasses, when required.

6.2.1 Exclusion Zone

For all workers in the Exclusion Zone, as well as for equipment-decontamination workers, protective clothing for this site-investigation work will be as follows:

- Non-permeable, hooded, chemical-resistant suits/aprons.
- Silver-Shield nitrile outer-gloves with inner 6.5 mil vinyl sample gloves.
- Neoprene boots and covers.

- Hard-hat, chemical-resistant steel-toed boots.
- Sleeves taped to gloves and pant cuffs taped to boots; when non-permeable, hooded, chemical-resistant suits are required.

When Level C PPE is required, full-face respirators with appropriate cartridges will be worn if conditions warrant and at the discretion of the SHSO.

6.2.2 Upgrading or Downgrading of Selected Protective Equipment

Upgrading or downgrading of selected protective equipment will be the decision of the SHSO and will be based on assessment of exposure potential. The Program Manager will be notified of PPE modifications. Employees will be protected to the maximum at the onset of the activity until actual contaminate exposure is established by SHSO monitoring.

7.0 EXCLUSION ZONE/AREA PROCEDURES

7.1 Exclusion Zones/Areas

The work area at each JPG site will be marked off with barricades or barricade tape, as necessary, during activities. Signs will be posted around the area reading, "AUTHORIZED PERSONNEL ONLY." Nominally, a 25-foot zone/area will be established around all work areas during work activities at JPG. At a minimum, this area will be large enough to protect bystanders or people outside the area, and will not create a safety hazard.

Workers in the exclusion-zone area will abide by the following:

- be wearing the appropriate level of PPE,
- have attended the daily Tailgate-Safety Meeting, and
- have the approval of the SHSO.

Visitors to the site will abide by the following:

- All visitors to the sites will be instructed to stay outside the Exclusion Zone and remain outside the support zone during the extent of their stay. Visitors shall be cautioned to avoid skin contact with contaminated or suspected contaminated surfaces. During visitation, hand-to-mouth transfers will be prohibited with special precautions not to eat, drink, smoke, chew gum, or chew tobacco. The use of alcohol or drugs on the job is prohibited.
- Visitors requesting to observe work conducted in the Exclusion Zone and Decontamination Zones must wear all appropriate personal-protective devices before entering the contaminated zones. They must provide to the SHSO a copy of the medical examination as outlined in Section 3.0 of this plan, and will be required to sign in and out of the job site. If respiratory-protective devices are necessary, visitors who wish to enter the Exclusion Zone must produce evidence that they have had respiratory-protection training, including respiratory fitting and medical certification, within the past 12 months.
- Visitor access to the Exclusion Zone must be cleared by the Program Manager or Project Manager.

It should be noted that the above requirements do not apply to JPG "Authorized Visitors" personnel. The JPG Safety Officer should establish requirements for JPG personnel to enter work sites.

8.0 DECONTAMINATION

8.1 Personnel Decontamination

PPE worn on-site will not be worn off-site without prior decontamination. All site personnel shall utilize a decontamination procedure, Appendix A, whenever they leave the site. If site conditions require that the level of protection be upgraded or downgraded, the decontamination procedure will be modified by the SHSO.

The decontamination station at the site will include suitable receptacles for the disposal of used protective clothing. Polyethylene bags may be used for this purpose, provided they are sealed daily. Contaminated protective clothing will not be removed from the decontamination area until it has been properly bagged. Decontamination areas will be established outside of all exclusion zones.

Disposable materials (chemical-resistant suits, gloves, etc.) suspected of being contaminated will be placed in plastic bags, drummed and labeled on-site, and disposed of properly.

Adequate facilities for washing hands will be made available at the decontamination stations. Tubes of hand cream, rinse water, and clean rags for drying are sufficient. Hands will be washed prior to eating or drinking and before leaving the site at the end of each shift.

All breaks must be taken in an area identified by the SHSO. Employees shall wash their hands and faces with soap and water before proceeding to the designated break area.

8.2 Equipment Decontamination

Before leaving the site, equipment suspected of being contaminated will be decontaminated or containerized as specified by the SHSO. Verification that equipment leaving the site has been adequately decontaminated is the responsibility of the on site Project Manager.

8.3 Injury/Illness Decontamination

Based on the available information, the type of action required should be decided and the necessary steps implemented. Some actions may be done concurrently. No one should attempt emergency response or rescue until backup personnel and evacuation routes have been identified. Rescue/response may include the following actions:

- **Enforcement of the Buddy System.** Allow no one to enter a contaminated area, confined space, or hazardous area without a partner. At all times, personnel in the Exclusion Zone should be in the line-of-sight or communications contact with the supervisor or designee.

- **Survey of Casualties.** Locate all victims and assess their condition. Determine resources needed for stabilization and transport.
- **Assessment of Hazards.** Assess existing and potential hazards to site personnel and the off-site population. Determine (1) whether and how to respond, (2) the need for evacuation of site personnel and off-site population, and (3) the resources needed for evacuation and response.
- **Request for Aid.** Contact the required off-site/on-site personnel or facilities, such as the ambulance, fire department, and police.
- **Allocation of Resources.** Allocate on-site personnel and equipment to rescue and initiate incident-response operations.
- **Control of Emergency.** Bring the hazardous situation under complete or temporary control, and use measures to prevent the spread of the emergency.
- **Evacuation of Victims.** Remove or assist victims from the area.
- **Decontamination of Uninjured/Injured Personnel.** Use established procedures to decontaminate uninjured personnel in the contamination area. If the emergency makes this area unsafe, establish a new decontamination area at an appropriate distance. Decontaminate victims before or after stabilization as their medical condition dictates (Decision Aid For Emergency Decontamination, see Figure 1).
- **Stabilization of Victim and Area.** Administer any medical procedures that are necessary before the victims can be moved. Stabilize or permanently fix the hazardous condition. Attend to what caused the emergency and anything damaged or endangered by the emergency (e.g., drums, tanks).
- **Minimization of Transport Contamination.** Take measures to minimize chemical contamination of the transport vehicle, ambulance, and hospital personnel.
- **Evacuation of Site Personnel.** Evacuate site personnel by (1) informing public-safety personnel (coordinator for hazardous-chemical emergencies at JPG is the Chief of Safety, Allen Dunham) that there is a potential or actual need to evacuate the off-site population, (2) moving personnel upwind of the incident, and (3) monitoring the incident for significant changes. The hazards may diminish, permitting personnel to reenter the site, or the hazards may increase, requiring public evacuation.

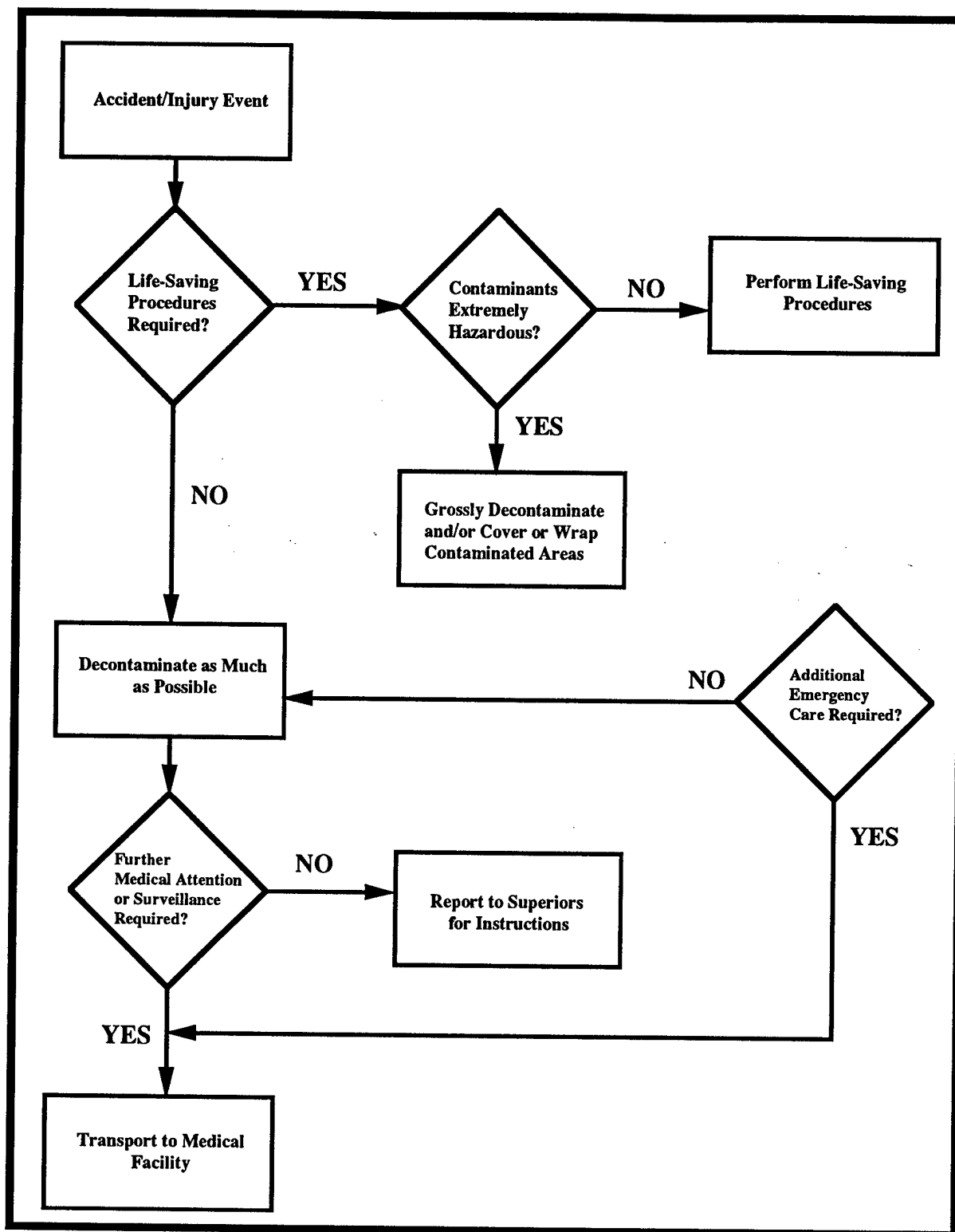


Figure 1. Decision Aid for Emergency Decontamination

If time allows, the following PPE decontamination sequence should be followed for personnel exhibiting signs of illness or injury:

Personnel-Modified Level D

- Outer Glove Wash
- Outer Glove Rinse
- Boot Wash
- Boot Rinse
- Outer Glove Drop
- Tyvek Coverall Drop
- Boot Drop
- Inner Glove Drop

Personnel-Level C (Respiratory Protection)

- Outer Glove Wash
- Outer Glove Rinse
- Boot Wash
- Boot Rinse
- Outer Glove Drop
- Tyvek Coverall Drop
- Boot Drop
- Respirator Drop
- Cartridge/Canister Drop
- Respirator Wash
- Respirator Rinse (Hang to dry)
- Inner Glove Drop

Note: A respirator will not be used by more than one person without thorough sanitization of that respirator.

9.0 GENERAL WORK PRACTICES

9.1 Safety

Each employee shall acknowledge in writing the receipt of and understanding of this SHSP. This documentation will be maintained on-site by the SHSO. At least one copy of this plan will be available at each work location.

Legible and understandable precautionary all-weather labels will be affixed prominently to containers of contaminated scrap, waste, debris, and clothing. Each label will include the SECD contract title, contract number, contents, and date. The containers will be numbered sequentially and identified in a container-inventory logbook. Removal of contamination from protective clothing or equipment by blowing, shaking, or any other means that will disperse contaminants into the air is prohibited.

No food, beverages, or gum shall be present or consumed in the contaminated areas. No tobacco products, lighters, or matches shall be present or used, and cosmetics shall not be applied in the contaminated areas.

Transportation and disposal of contaminated materials shall comply with all applicable local, state, and federal regulations. These items will be addressed by the transporter and disposer. Containers shall be moved only with the proper equipment and shall be secured to prevent dropping or loss of control during transport.

Emergency equipment shall be located in the clean area in readily accessible locations.

All trenching, shoring, and excavation work must comply with all federal OSHA rules. During the operation, all employees shall be required to wash their hands and faces before eating, drinking, smoking, or applying cosmetics. All personnel shall be required to field wash, as a minimum, at the end of their shift before leaving the job site. Each employee shall wash his/her hands and face before taking breaks. All personnel shall avoid contact with potentially contaminated substances. Walking through puddles or mud, kneeling on the ground, etc., should be avoided whenever possible.

All electrical equipment shall comply with the National Electric Code (1990 Edition).

Hunting on JPG commences on 10-7-92 and runs through 12-15-92. Extreme caution shall be exercised, and orange vests will be worn.

Excess equipment and monitoring equipment shall not be placed on potentially contaminated surfaces. Provisions will be made for cleaning gross contamination from boots and suits in the Exclusion Zone.

Appropriate action to provide secure footing will be taken at all locations where personnel will be working.

Operations must be suspended and corrective action taken if the ambient-airborne concentration of flammable vapors exceeds 10 percent of the LEL. A combustible-gas indicator shall be available to make this determination. Combustible-gas readings of the general work area will be made if necessary.

Consideration will be given and the appropriate action taken in the event of adverse weather conditions (e.g., lightning, thunderstorms, extreme temperatures, etc.).

9.1.1 Communications

A permanently assigned JPG escort will provide mobile radios.

9.2 Heat/Cold Stress

Heat stress may be of concern depending upon the ambient temperature. The heat stress of employees on-site will be monitored by the Wet Bulb Globe Temperature Index (WBGT) technique. This method will require the use of a heat-stress-monitoring device, such as the Wibget Heat Stress Monitor (Reuter Stokes). Area monitoring will be conducted.

The WBGT will be compared to the TLVs outlined in the ACGIH TLVs manual, and a work/rest regimen will be established, as necessary, according to the WBGT obtained. Note that 3 to 5 °C must be added to the WBGT, due to the wearing of impermeable protective clothing. Once the initial work/rest regimen has been established, physiological monitoring (i.e., heart rate) will be used to determine the work/rest regimen. One or more of the following control measures can be used to help control heat stress:

- Adequate liquids will be provided to replace lost body fluids. Employees must replace water and salt lost from sweating. Employees must be encouraged to drink more than the amount required to satisfy thirst. Thirst is not an accurate indicator of adequate salt and fluid replacement.
- Replacement fluids can be a 0.1 percent salt-water solution, commercial mixes such as Gatorade or Quick Kick or a combination of these, and fresh water. Salt tablets will not be used.
- A work regimen that will provide adequate rest periods for cooling down must be established. This may require additional shifts for workers or earlier/later work schedules.
- Cooling devices such as vortex tubes or cooling vests can be worn beneath protective garments.
- All breaks are to be taken in a shaded rest area.
- Employees shall remove impermeable protective garments during rest periods.

- Employees shall not be assigned other tasks during rest periods.
- All employees shall be informed of the importance of adequate rest, acclimatization, and proper diet in the prevention of heat stress.

9.2.1 *Signs and Symptoms of Heat Stress*

- Heat rash may result from continuous exposure to heat or humid air.
- Heat cramps are caused by heavy sweating with inadequate electrolyte replacement. Signs and symptoms include:
 - Muscle spasms
 - Pain in the hands, feet, and abdomen
- Heat exhaustion occurs from increased stress on various body organs, including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:
 - Pale, cool, moist skin
 - Heavy sweating
 - Dizziness
 - Nausea
 - Fainting
- Heat stroke is the most serious form of heat stress; temperature regulation fails, and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occur. Competent medical help must be obtained immediately. Signs and symptoms are:
 - Red, hot, usually dry skin
 - Lack of or reduced perspiration
 - Nausea
 - Dizziness and confusion
 - Strong, rapid pulse
 - Coma

9.2.2 *Cold Stress*

If work is performed continuously in the cold, a heated warming shelter shall be provided nearby. Workers shall be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the exposure. The onset of heavy shivering, frostnip, the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for immediate attention. Outer wet clothing should be immediately removed, and the remaining clothing should be loosened to permit sweat evaporation or a change of dry clothing

provided. Dehydration, or the loss of body fluids, occurs in a cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the site to provide caloric intake and fluid volume. The intake of coffee should be limited because of a diuretic and circulatory effect.

First aid for mild hypothermia includes using heat to raise the individual's body temperature. Heat may be applied to the person in the form of heat packs, hot-water bottles, and blankets. The signs and symptoms of severe hypothermia are:

- Unconsciousness
- Slowed respirations or respiratory arrest
- Slowed pulse or cardiac arrest
- Irrational or stuporous state
- Muscular rigidity

First aid for severe hypothermia includes handling the individual very gently; rough handling may set off lethal heart rhythms. DO NOT rewarm the severely hypothermic individual. To do so will cause the heart to develop a lethal heart rhythm. Severe hypothermia is a medical emergency, and the individual should be immediately transported to a medical facility.

Persons working outdoors in temperatures at or below freezing may be subject to local cooling. Areas of the body that have a high surface area-to-volume ratio, such as fingers, toes, and ears, are the most susceptible. The following is a description of the three categories of local cooling:

- Frostnip. Characterized by sudden blanching or whitening of the skin.
- Frostbite. Skin has a waxy or white appearance and is firm to the touch, but tissue beneath is resilient. Frostbite can be treated by (1) covering affected area with warm hands, (2) placing bare frostbitten feet under the clothing and against the skin of a companion, and (3) retreating to a warm area.
- Freezing. Tissues are cold, pale, and solid. This is a medical emergency, and the individual must be immediately transported to a medical facility.

Prevention of cold stress is a function of whole-body protection. Adequately insulated clothing will be provided when air temperature is below 40 °F. In addition, reduced-work periods may be necessary in extreme conditions to allow rest in a warm area.

9.3 Construction Safety

All construction work associated with this project will comply with 29 CFR 1926. All proposed activities will be reviewed by the SHSO prior to initiation.

9.4 Subcontractor Safety

Any subcontractors used during this project will be required to adhere to the requirements of this SHSP. For a specific function not covered in the SHSP, the subcontractor will be required to submit a H&S Plan for approval by SECD and JPG for the specific function to be performed by the subcontractor.

10.0 EXCAVATION PROCEDURES

Trenching activities will be in accordance with OSHA 29 CFR 1926 Subpart P.

- All trenches greater than 4 feet in depth will be maintained at a 1-to-1 slope if the personnel is required to enter the excavation.
- A means of egress from trench excavations that are 4 feet or more in depth will be provided. This can be accomplished by the use of ladders, ramps, or stairways and must be placed so as to require no more than 25 feet of lateral travel for employees.
- All surface encumbrances that create a hazard to employees will be removed or supported, as necessary, to safeguard personnel.
- Prior to trenching activities, all underground installations/utilities are to be located prior to opening an excavation. This should be accomplished by reviewing underground-utility drawings and utilizing an underground-utility-locating service. All excavations will be cleared by utility personnel prior to any excavation activity.
- No employee will be permitted underneath loads handled by lifting or digging equipment. Employees will stand away from any equipment during digging activities to avoid being struck by equipment or by any spillage or falling debris.
- No item that could potentially roll or slide, including equipment (e.g., backhoes), will be placed closer than 2 feet from the edge of the excavation.
- Daily inspections of excavations, the adjacent areas, and protective systems will be made by a competent person for evidence of a situation that could result in possible cave-ins, indications of protective systems, hazardous atmospheres, or other hazardous conditions. An inspection will be conducted by the competent person prior to the start of work and as needed throughout the shift. Inspections will also be made after every rainstorm or other hazard-increasing occurrence. These inspections are only required when employee exposure can be reasonably anticipated.
- Where the competent person finds evidence of a situation that could result in a possible cave-in, indications of failure of protective systems, hazardous atmospheres, or other hazardous conditions, exposed employees will be removed from the hazardous area until the necessary precautions have been taken to ensure their safety.
- Adequate physical-barrier protection will be provided at all remotely located excavations. All trenches, wells, pits, etc., will be barricaded or covered. Upon completion of exploration and similar operations, temporary trenches, wells, pits, etc., will be backfilled.

11.0 EMERGENCY PROCEDURES

The SHSP has been established to allow site operations to be conducted without adverse impacts on workers' health and safety. These additional supplementary emergency response procedures have been developed to cover extraordinary conditions that might possibly occur at JPG.

11.1 General

All incidents will be dealt with in a manner to minimize adverse health risk to site workers. In the event that an incident occurs, the following procedures will be followed:

- First aid or other appropriate initial action will be administered by properly trained personnel who are closest to the incidents. This assistance will be conducted in a manner to ensure that those rendering assistance are not placed in a situation of unacceptable risk.
- All incidents will be reported to the Project Manager or his designee. The Project Manager is responsible for coordinating the emergency response in an efficient, rapid, and safe manner.
- All workers on-site are responsible for conducting themselves in a mature, calm manner in the event of an incident. All persons must conduct themselves in a manner that will avoid spreading the danger to themselves and to surrounding workers.
- A list of emergency phone numbers will be provided.
- Site-security personnel will be notified of the worker's name and work location during facility off-duty hours (dial 13 or extension 7310). It is anticipated that all work will be performed during normal working hours at JPG. However, if work is to be conducted during other than normal working hours, special arrangements must be made with the appropriate emergency-services organizations and will be detailed in the emergency-response section of this SHSP.
- All incidents involving personnel or property will be reported in accordance with SECD incident-reporting procedures.

The following emergency equipment will be available at the site:

- First-aid kit
- Fire extinguisher and blanket
- Pressurized eye wash

The Project Manager will document all health-and-safety-risk incidents.

11.1.1 *Emergency Warning Signals for JPG*

- **Enemy attack.** A 3-to-5-minute series of short blasts from a siren. All persons are to go to shelters immediately.
- **Alert.** A 3-to-5-minute steady signal from a siren. Emergency-action people proceed to assigned stations. Detailed instructions for other personnel will be provided by phone or radio.
- **Test of Time.** One short blast from a siren at 0730, 1200, and 1600 hours each day to indicate time. Times may vary according to tour of duty.
- **Tornado.** A 3-to-5-minute steady tone from a siren. In case of power failure, an air horn will be used. A vehicle with a siren will be sent to remote areas. **TAKE COVER IMMEDIATELY.**
- **All clear.** A series of three 15-second blasts at 30-second intervals. Everyone may leave shelters at this time.

11.2 **Emergency Contacts/Telephone Number at JPG**

In the event of an emergency, the Base Fire Department will respond with an ambulance. They are a U.S. Army Certified Hazardous Materials Team. They will treat the patient for pain and trauma, and stabilize the patient. If further care is needed, the patient will be transferred to a civilian ambulance for transfer to King of Daughters Hospital in Madison, Indiana.

If injuries occur, you are required to immediately notify the Safety Department at extension 7257.

The following telephone numbers will be posted at a conspicuous location where field activities will be performed:

Emergency (Fire Department)	13
.	7127
Security Police	13
.	7310
Ambulance/Medical	13
.	7330
King of Daughters Hospital	(812) 265-5211
Chief of Safety, Allen Dunham	7257
USATHAMA Safety Point of Contact (D. Fiersel)	(410) 671-4811
USATHAMA Project Officer (K. Quirk)	(301) 671-3261

11.3 Responses to Specific Situations

Emergency procedures for specific situations are given in the following paragraphs.

11.3.1 *Evacuation Procedures*

In the event of an emergency situation during site operations, all personnel will evacuate field-site locations and assemble at the "safe area" designated by the SHSO. Once all field personnel is accounted for, the emergency response personnel will be notified by telephone of the emergency. When making the report, describe the complete situation including the following items:

- Identification of caller
- Time and location of emergency
- Type of emergency: explosion, fire, or release of toxic vapors
- Extent of fire involved
- Type of agent released, if applicable
- Casualties, intruders, or hostages
- Estimated wind speed and direction

All field personnel assembled at the safe area will await further instructions from emergency-response personnel. Additional training will be conducted by JPG safety personnel on emergency-evacuation routes and signals for a JPG evacuation.

11.3.2 *Worker Injury*

If an employee working in a contaminated area is physically injured, Red Cross First-Aid procedures will be followed. Depending on the severity of the injury, emergency medical response may be sought. If the employee can be removed, he/she will be removed from the source of contamination. Decontamination procedures, additional first aid, or preparation for transportation will be conducted at a safe distance from the work site.

If the injury to the worker is chemical in nature (e.g., overexposure), the following First-Aid procedures are to be instituted:

- **Eye Exposure.** If contaminated soils or liquids get into the eyes, wash immediately at the emergency station using large amounts of potable buffered water and by lifting the lower and upper lids occasionally. Wash for at least 15 minutes. Obtain medical attention immediately.
- **Skin Exposure.** If contaminated solids or liquids get on the skin, promptly neutralize and wash the contaminated skin using soap or mild detergent and water for at least 15 minutes. Obtain medical attention immediately when exposed to concentrated solids or liquids. Wash face and hands prior to eating or leaving the site.

11.3.3 Fire

As a fire-prevention measure, no smoking or fires shall be permitted wherever there may be dry grass, other flammable material, or wherever the U.S. Army specifically forbids such practices. Vehicles and equipment will not be left idling or parked in or around areas where catalytic converters may cause grass fires.

Hot work, such as welding or cutting, shall be performed only as absolutely necessary. Hot work shall only be conducted after issuance of a hot-work permit, which will require appropriate site inspection for fire hazards. A fire watch is required with all hot work. At least two appropriate fire extinguishers shall be available during hot-work procedures. Hot-work permits are required at JPG. Prior clearance shall be obtained in writing from the JPG Fire Department. Dry-chemical A:B:C fire extinguishers will be provided. If a localized fire breaks out, dry-chemical fire extinguishers will be used to bring the occurrence under control. If necessary and feasible, a fire blanket, soil, or other inert materials will be placed on the burning area to extinguish the flames and to minimize the potential for spreading. The JPG Fire Department will be notified of any and all fires and will be contacted for assistance as required. The JPG Fire Department can be contacted by calling 7127.

If an uncontrolled fire develops that potentially may release toxic gases, all persons in the immediate vicinity will be evacuated. Contact with the fire department will immediately be made to notify fire-department personnel of the location and materials involved. Under emergency situations, call extension 13.

11.3.4 Discovery of Potential Unexploded Ordnance

Upon identification of a potential UXO hazard, evacuate to a predesignated safe area located at least 200 feet upwind from the work site. Notification to JPG Demolition Support regarding potential UXO will be done under the direction of contracted EODT personnel.

11.3.5 Adverse Weather Conditions

In the event of adverse weather conditions, the SHSO and the Project Manager will determine if work can continue without compromising the health and safety of any field workers. Items to be considered prior to determining if work should continue are:

- Potential for heat/cold stress
- Treacherous weather-related working conditions (e.g., tornadoes)
- Limited visibility
- Potential for electrical storms
- Weather conditions that prevent JPG from open detonation

11.4 Spills

Handling procedures have been developed to limit potential problems with materials spillage. In the event of a spill at the site, the area will be isolated from traffic by the SHSO or Project Manager. Spills will be addressed for PPE requirements prior to any work activity. Spilled solids will be removed and loaded into appropriate containers for subsequent placement or taken to the original destination. Liquid spills will be contained with absorbent material, and the absorbent will then be loaded into appropriate containers for disposal. JPG will be notified of any spill.

11.5 Incident Documentation

The Program Manager will produce a report describing the following:

- The incident (including date and time) that necessitated the notification.
- Date, time, and names of all persons/agencies notified and their responses.
- Resolution of the incident (including duration) and the method/corrective action involved.

This report will be submitted to the U.S. Army by the Program Manager within 2 working days of the resolution of the event. Additionally, all incidents involving personnel or property will be reported in accordance with SECD incident-reporting procedures.

12.0 SITE-SPECIFIC REQUIREMENTS

12.1 Building 185 Incinerator

- Contaminants

Heavy Metals.

- Monitoring

Personnel breathing-zone samples will be collected for the purpose of monitoring employee exposures to metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level D PPE will be required while working at this site.

12.2 Building 177 Sewage Treatment Plant

- Contaminants

Heavy metals, inorganics, and petroleum hydrocarbons.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required for sampling activities being performed in this area. If PID readings exceed 1 ppm, the level of protection will be upgraded to Level C PPE.

12.3 Explosive Burning Area

- Contaminants

Heavy metals and explosive compounds.

- Monitoring

Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals and explosive contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required for sampling activities being performed in this area.

12.4 Abandoned Landfill

- Contaminants

Heavy metals, pesticides, explosive compounds, and petroleum hydrocarbons.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals and explosive contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required for sampling activities being performed in this area. If PID readings exceed 1 ppm, the level of protection will be upgraded to Level C PPE.

12.5 Wood-Storage Piles

- Contaminants

VOCs, semi-volatile organic compounds (semi-VOCs), pentachlorophenol (PCP), and dioxins.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Activities performed in this area will be in Level C PPE. After data are obtained from site monitoring, PPE may be downgraded or upgraded as appropriate. If PID-monitoring results are greater than 20 ppm, Level B PPE will be required. If monitoring results are less than 20 ppm, work may continue in Level C PPE. If PID readings are less than 1 ppm, PPE may be downgraded to modified Level D at the discretion of the SHSO.

12.6 Red Lead Disposal Area

- Contaminants

Heavy Metals.

- Monitoring

Personnel breathing-zone samples will be collected for the purpose of monitoring employee exposures to metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level D PPE will be required while working this area.

12.7 Small Arms Firing Range

- Contaminants

Heavy metals, asbestos, and explosive compounds.

- Monitoring

Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals, asbestos, and explosive contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level C PPE will be required when performing activities at this site. Downgrading to Level D PPE will be at the discretion of the SHSO after a thorough evaluation of site conditions and the potential for uptake of site contaminants.

12.8 Burning Ground

- Contaminants

Heavy metals, VOCs, semi-VOCs, explosive compounds, and paint residues.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals and explosive contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level C PPE will be required when performing activities at this site. Downgrading to Level D PPE will be at the discretion of the SHSO after a thorough evaluation of site conditions and the potential for uptake of site contaminants.

12.9 Gate 19 Landfill

- Contaminants

Heavy metals, methylene chloride/polurethane residues, and trichloroethylene (TCE).

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Activities performed in this area will be in Level C PPE. After data are obtained from site monitoring, PPE may be downgraded or upgraded as appropriate. If PID-monitoring results are greater than 20 ppm, Level B PPE will be required. If monitoring results are less than 20 ppm, work may continue in Level C PPE. If PID readings are less than 1 ppm, PPE may be downgraded to modified Level D at the discretion of the SHSO.

12.10 Burning Area for Explosive Residue

- Contaminants

Heavy metals, explosive compounds, and herbicides.

- Monitoring

Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals, herbicides, and explosive contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required while working at this site.

12.11 Building Solvent Pits

- Contaminants

VOCs.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 10 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required when performing activities at this site. If PID readings greater than 10 ppm are detected, upgrading of PPE to Level C will be required.

12.12 Old Fire Training Pit

- Contaminants

Heavy metals and petroleum hydrocarbons.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required when performing activities at this site. If PID readings greater than 1 ppm are detected, upgrading of PPE to Level C will be required.

12.13 Yellow Sulfur Disposal Area

- Contaminants

Heavy metals and sulphur.

- Monitoring

Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals and sulphur.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level D PPE will be required while working this area.

12.14 Burn Area South of New Incinerator

- Contaminants

Heavy metals, explosive compounds, and petroleum hydrocarbons.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to heavy metals and explosive contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level D PPE will be required while working this area.

12.15 Potential Ammo Dump Site

- Contaminants

Explosive compounds.

- Monitoring

Personnel breathing-zone samples will be collected for assessing employee exposures to explosive contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings. UXO support will be required when performing any activity associated with this site.

- PPE

Level D PPE will be required while working this area.

12.16 Asbestos Containing Materials

- Contaminants

Asbestos.

- Monitoring

Personnel breathing-zone samples will be collected for assessing employee exposures to asbestos contaminants.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level C PPE will be required for personnel collecting bulk samples. If analytical analysis indicates exposure levels less than 0.1 f/cc, PPE may be downgraded to modified Level D.

12.17 Underground Storage Tanks

- Contaminants

Petroleum hydrocarbons.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. When LEL readings exceed 10 percent, all personnel will be withdrawn from the area until LEL readings are less than 10 percent.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required when performing activities at this site. If PID readings greater than 1 ppm are detected, upgrading of PPE to Level C will be required. If PID readings greater than 20 ppm are detected, upgrading of PPE to Level B will be required, or employees at this site will be evacuated until readings of less than 20 ppm are obtained.

12.18 Off-Site Water Supply Wells

- Contaminants

Petroleum hydrocarbons.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific chemical-action levels. When LEL readings exceed 10 percent, all personnel will be withdrawn from the area until LEL readings are less than 10 percent.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required when performing activities at this site. If PID readings greater than 1 ppm are detected, upgrading of PPE to Level C will be required. If PID readings greater than 20 ppm are detected, upgrading of PPE to Level B will be required, or employees at this site will be evacuated until readings of less than 20 ppm are obtained.

12.19 Buildings 279 and 305 (Temporary Waste Storage Areas)

- Contaminants

Heavy metals, PCBs, VOCs, and semi-VOCs.

- Monitoring

A PID and a combustible-gas monitor will be used. When PID readings exceed 1 ppm, colorimetric tubes will be used for chemical identification and determination of specific

chemical-action levels. Personnel breathing-zone samples will be collected for assessing employee exposures to PCBs and heavy metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Modified Level D PPE will be required when performing activities at this site. If PID readings greater than 1 ppm are detected, upgrading of PPE to Level C will be required. If PID readings greater than 20 ppm are detected, upgrading of PPE to Level B will be required, or employees at this site will be evacuated until readings of less than 20 ppm are obtained.

12.20 Buildings 105, 186, 204, 211, and 227 (Temporary Storage Areas)

- Contaminants

Heavy metals and pesticides.

- Monitoring

Personnel breathing-zone samples will be collected for assessing employee exposures to pesticides and metals.

- Physical Hazards

The site-specific physical hazards will be addressed in detail after the preinspection tour of these sites has been completed. Site-specific hazards will also be presented during the Pre-Project Training and at the daily Tailgate-Safety Meetings.

- PPE

Level D PPE will be required while working in these areas.

STAFF TRAINING VERIFICATION

I have read and understand the content and intent of this: SECD JPG Site Health and Safety Plan 1992.

Program Manager _____

Site Health & Safety Officer _____

Project Manager _____

Site Supervisor _____

Hydrologist _____

Geologist _____

Sampler #1 _____

Sampler #2 _____

Sampler #3 _____

Driller #1 _____

Driller #2 _____

Driller #3 _____

EODT #1 _____

EODT #2 _____

EODT #3 _____

Visitors _____

APPENDIX A
DECONTAMINATION PROCEDURE

DECONTAMINATION PROCEDURE

This procedure is for safely decontaminating, packaging, handling, and the transportation of used Personal Protective Equipment (PPE) produced by all operations/activities of the project. These include polyethylene-coated tyvek, tyvek, butyl nitrile gloves, latex gloves, rubber booties, respirator cartridges and duct tape.

The used PPE will be packed into containers for disposal.

PPE

Level B, Level C, Modified Level D and Level D

Procedure

The containers used for PPE will be packaged, transported, and disposed of in the following manner:

1. At any time during the project that working personnel need to decontaminate (leave the work area), they will follow these steps:
 - a) At the decontamination station, there will be PPE containers. Any person deconning will remove their PPE according to SEC Donohue (SECD) Management procedures;
 - b) The workers will then place all disposable equipment into the containers for disposal. Each day, the containers will be sealed.
2. When a container is full of used PPE, or at the end of the day, the container will be closed and sealed in the following manner:
 - a) The top of the container will be sealed with duct tape.
 - b) Containers will be labeled with contents, suspected contaminants, date and SECD contract number/title, containers will be identified in an inventory log book.
 - c) Containers will then be stored at a designated location for future disposal.

Decontamination Procedure

1. EQUIPMENT WORN

The number of decon stations will be dependent upon the level of PPE being utilized and will be determined by the Site Health and Safety Officer (SHSO). The full

decontamination procedure outline is for workers wearing appropriate levels of protection (with taped joints between gloves, boots, and suits), including the following:

- One-piece, hooded, chemical-resistant splash suit;
- Respirators or self-contained breathing apparatus (SCBA);
- Hard hat;
- Chemical-resistant, steel toed boots;
- Boot covers;
- Inner and outer gloves.

2. PROCEDURE FOR FULL DECONTAMINATION

NOTE: ALL PERSONNEL WILL BE WEARING DISPOSABLE CLOTHING. THIS PROCEDURE WILL BE USED ONLY IF CONTAMINATION WAS DETECTED THROUGH THE USE OF MONITORING EQUIPMENT.

Station 1: Segregated Equipment Drop

Deposit equipment used on-site (tools, sampling devices and containers, monitoring instruments, radios, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Equipment:

Various sized containers
Plastic liners
Plastic drop cloths

Station 2: Reduction of Gross Contamination

If gross contamination is present on the Disposable Personal Protective Equipment, it will be sprayed lightly with a detergent/water solution.

Equipment:

Container (20-30 gallons)
2-3 long-handle, soft-bristle scrub brushes

Station 3: Boot Cover and Glove Wash

Standing inside a containment device, scrub outer boot covers, and gloves with detergent/water solution.

Equipment: Container (20-30 gallons)

Detergent/water solution

2-3 long-handle, soft bristle scrub brushes

Station 4: Boot Cover and Glove Rinse

Rinse off detergent/water solution from Station 3 using water. Repeat as many times as necessary.

Equipment: Container (30-50 gallons)

Water

2-3 long-handle, soft-bristle scrub brushes

Station 5: Tape Removal

Remove tape around boots and gloves and deposit in a polyethylene container.

Equipment: Container (10-20 gallons)

Plastic liners

Bench or stool

Station 6: Outer Glove Removal

Remove outer gloves and deposit in a polyethylene container.

Equipment: Container (20-30 gallons)

Plastic liners

Station 7: Suit/Safety Boot Wash

Thoroughly wash chemical-resistant splash suit, SCBA, gloves, and safety boots. Scrub with long-handle, soft-bristle scrub brush and detergent/water solution. Wrap SCBA regulator with plastic to keep out water. Wash backpack assembly with sponges or cloths.

Equipment: Container (30-50 gallons)

Detergent/water solution

2-3 long-handle, soft-bristle scrub brushes

Small buckets
Sponges or cloths

Station 8: Suit/SCBA/Boot/Glove Rinse

Rinse off detergent/water solution using water. Repeat as many times as necessary.

Equipment: Container (30-50 gallons)

Water
Small buckets
2-3 long-handle, soft-bristle scrub brushes
Sponges or cloths

Station 9: Safety Boot Removal

Remove safety boots and deposit in a polyethylene container.

Equipment: Container (30-50 gallons)

Plastic liners
Bench or stool
Boot jack

Station 10: Splash Suit Removal

With assistance of a helper, remove splash suit. Deposit in a polyethylene container.

Equipment: Container (30-50 gallons)

Plastic liner
Bench or stool

Station 11: Inner Glove Wash

Wash inner gloves with detergent/water solution that will not harm skin. Repeat as many times as necessary.

Equipment: Detergent/water solution

Basin or bucket
Small table

Station 12: Inner Glove Rinse

Rinse inner glove with water. Repeat as many times as necessary.

Equipment: Water

Basin or bucket

Small table

Station 13: Facepiece/Respirator and Cartridge Removal

Remove respirator cartridges and deposit in a polyethylene container. Remove respirator/facepiece and deposit in a polyethylene container. Avoid touching face with gloves when removing respirator/facepiece.

Equipment: Container (10-20 gallons) for respirator cartridges

Container (30-50 gallons) respirators/facepieces

Plastic liners

Station 14: Inner Glove Removal

Remove inner gloves and deposit in a polyethylene container.

Equipment: Container (20-30 gallons)

Plastic liners

Station 15: Inner Clothing Removal

Remove clothing soaked with perspiration. Place in container with plastic liner. Do not wear clothing off-site since there is a possibility small amounts of contaminants might have been transferred in removing chemical-resistant splash suits.

Equipment: Water

Soap

Station 16: Emergency Decontamination

In the event a worker sustains a serious injury and must be deconned immediately, a pail of detergent/water solution will be poured over the injured person. The person will be wrapped inside a blanket and carried out of the exclusion zone. Emergency personnel will be notified.

**APPENDIX B
SPILL RESPONSE**

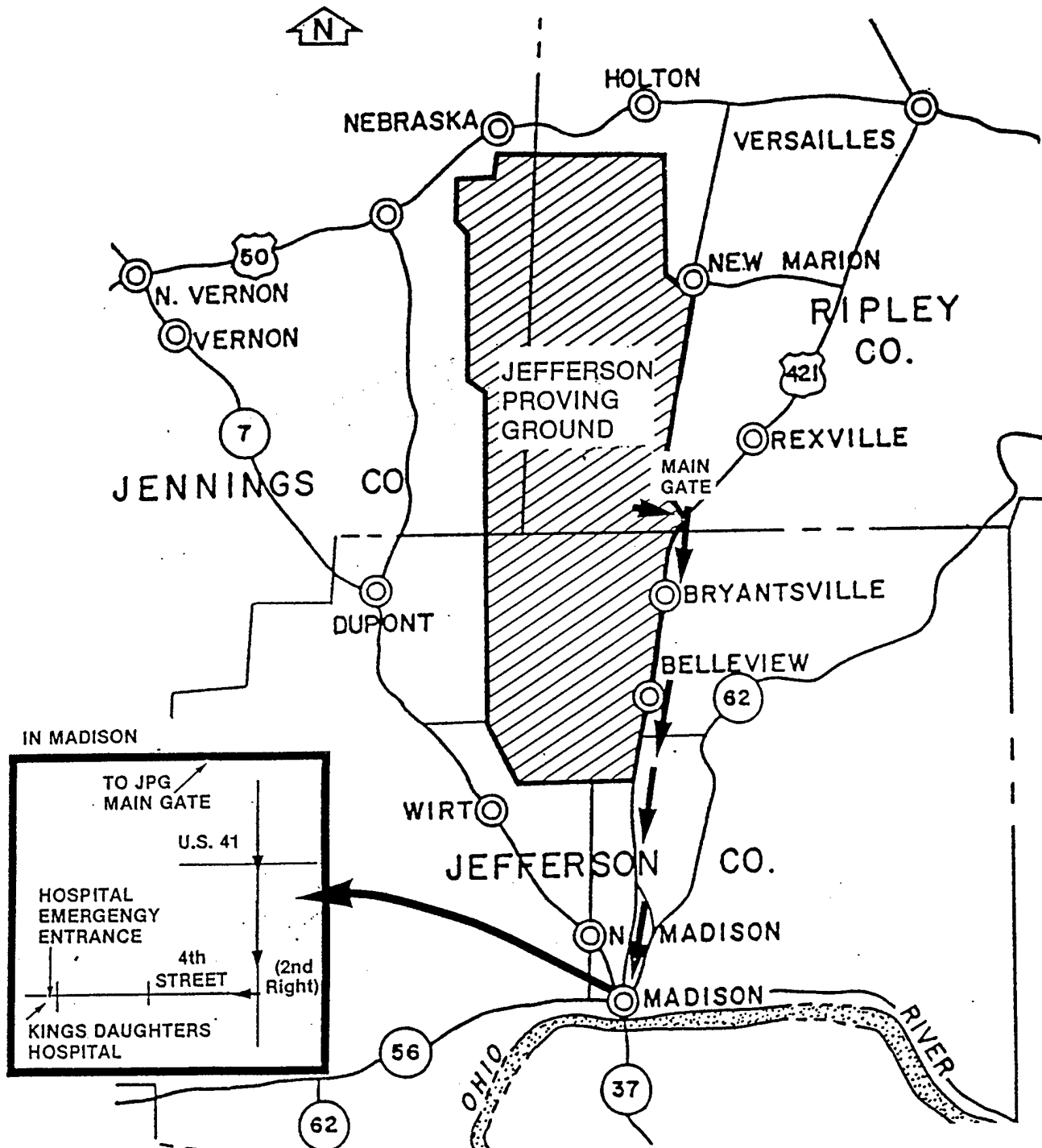
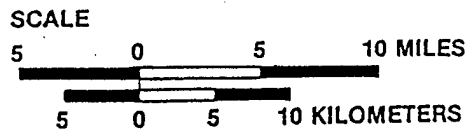
In the event of a spill at JPG, the area will be isolated from traffic and personnel by the SHSO and the Project Manager. Spilled solids will be removed and loaded into appropriate containers for subsequent placement or taken to the original destination. Liquid spills will be contained with absorbent material and the absorbent material will be loaded into appropriate containers for disposal. In the event of a spill the JPG "Spills Contingency Plan for Control of Spills and Hazardous Materials" shall be followed in the event of a significant spill. Report any spill to the Fire Department and the Environmental Manager, as soon as time permits.

The main objective is to contain and control any spilled material by using absorbent materials or dirt. If inclement weather is imminent, clean material should be used to contain the affected area to prevent contamination run-off. When decontaminating the affected area, clean towards the center of the spill when possible, reducing the possibility of spreading contamination.

Prior to loading/packaging contamination, ensure appropriate containers are used. Containers shall be decontaminated for exterior contamination prior to leaving the affected area.

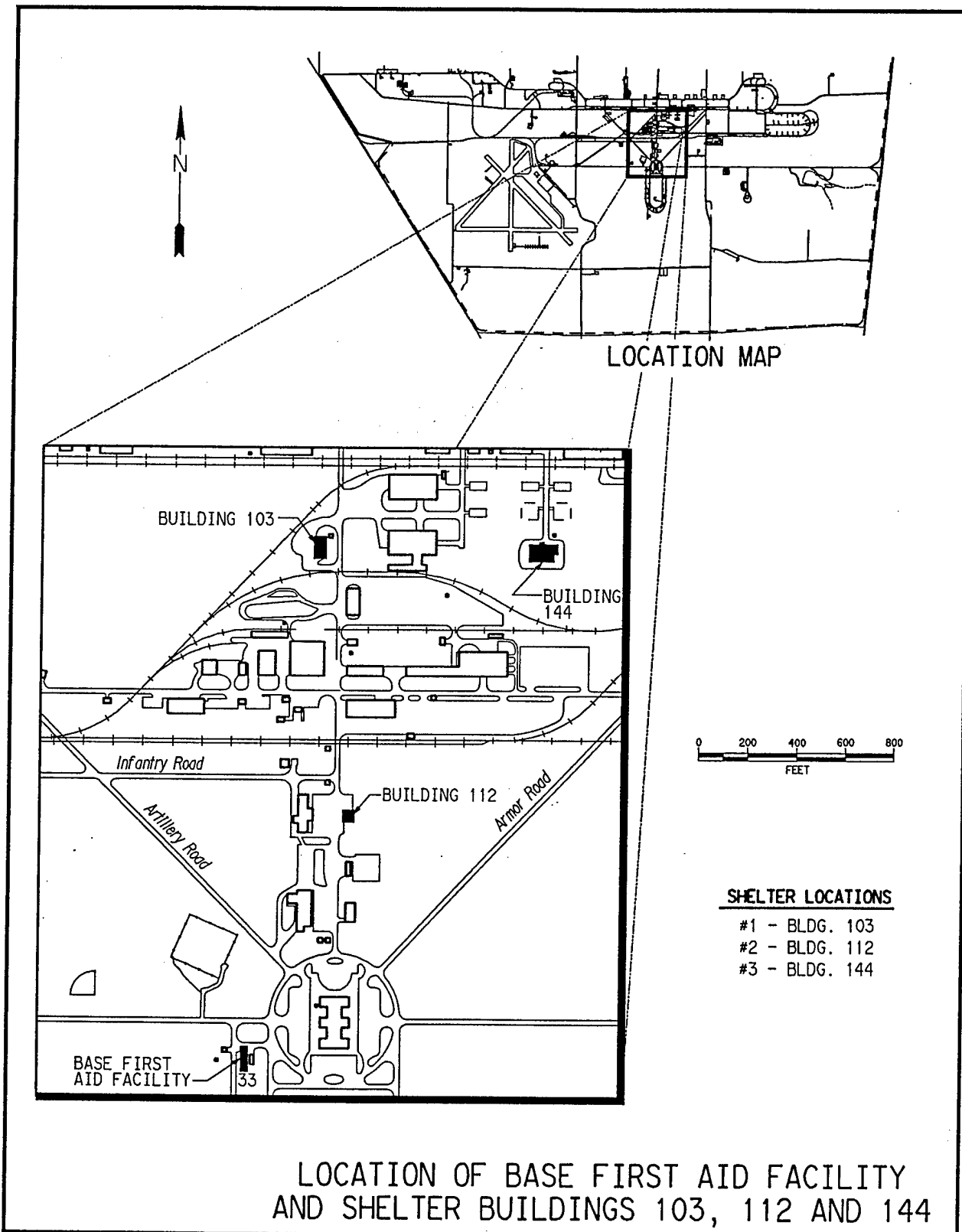
After removing all the contaminated material possible, with shovels and other equipment, the area may be washed down or swept to remove residual contamination if necessary. Use dust suppression to reduce airborne contamination when sweeping. After contaminated material has been removed, verification sampling will be performed to ensure adequacy of the clean up activity.

APPENDIX C
SITE MAP AND MAP TO MEDICAL FACILITIES



ROUTE FROM JPG TO KINGS DAUGHTERS HOSPITAL

Prepared for:
U.S. Army Toxic and Hazardous
Materials Agency
Aberdeen Proving Ground, Maryland



APPENDIX D
MATERIAL SAFETY DATA SHEETS

MSDSs for the potential on-site contaminants listed in Section 1.3 of the Site Health and Safety Plan are maintained in the Facility Safety Office. All employees are to be informed as to the location of MSDSs.

Any chemical brought on-site by Chem-Nuclear Environmental Services personnel or their subcontractors, will be identified to the SHSO. The SHSO will ensure that MSDSs are accurate for the chemical brought on-site, and that MSDSs are incorporated into the appropriate Appendix of the SHSP. A copy of the MSDS will be provided to the Facility Safety Office.

TYPE 1/2

File 1; Entry 1; Accession No. 10508
(MID) Material Identification:

D2664 -03 (2,4-DICHLOROPHENOXY)ACETIC ACID
EFFECTIVE: 05/01/89

ISSUED: 09/27/91

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SECTION I - PRODUCT IDENTIFICATION

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PRODUCT NAME: (2,4-DICHLOROPHENOXY)ACETIC ACID
COMMON SYNONYMS: 2,4-D
CHEMICAL FAMILY: ORGANIC ACIDS
FORMULA: ClC1=CC=C(C=C1)C(=O)O
FORMULA WT.: 221.04
CAS NO.: 94-75-7
NIOSH/RTECS NO.: AG6825000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: H228

(PHAZ) Primary Hazards:

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PRECAUTIONARY LABELING

=====

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	2	MODERATE
FLAMMABILITY	-	1	SLIGHT
REACTIVITY	-	1	SLIGHT
CONTACT	-	2	MODERATE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

WARNING

HARMFUL IF SWALLOWED.
AVOID CONTACT WITH EYES, SKIN, CLOTHING. KEEP IN TIGHTLY CLOSED CONTAINER.
WASH THOROUGHLY AFTER HANDLING.

INTERNATIONAL LABELING

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH
PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

SAF-T-DATA* STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

(COMP) Components:

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SECTION II - COMPONENTS

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COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
(2,4-DICHLOROPHENOXY)ACETIC ACID	94-75-7	90-100	10 MG/M3	N/E

(PHYS) Physical Properties:

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SECTION III - PHYSICAL DATA

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BOILING POINT: N/A	VAPOR PRESSURE (MMHG): N/A
MELTING POINT: 138 C (280 F) (AT 760 MM HG)	VAPOR DENSITY (AIR=1): N/A
SPECIFIC GRAVITY: 1.56 (H2O=1)	EVAPORATION RATE: N/A
SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)	% VOLATILES BY VOLUME: 0 (21 C)
PH: N/A	
ODOR THRESHOLD (P.P.M.): N/A	PHYSICAL STATE: SOLID
COEFFICIENT WATER/OIL DISTRIBUTION: N/A	
APPEARANCE & ODOR: WHITE TO YELLOW CRYSTALLINE POWDER. ODORLESS.	

(FHAZ) Fire Hazards:

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

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FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS

NONE IDENTIFIED.

TOXIC GASES PRODUCED

HYDROGEN CHLORIDE, PHOSGENE, CARBON MONOXIDE, CARBON DIOXIDE

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

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SECTION V - HEALTH HAZARD DATA

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THRESHOLD LIMIT VALUE (TLV/TWA): 10 MG/M3

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 10 MG/M3

TOXICITY OF COMPONENTS

NO INFORMATION IS AVAILABLE

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: IRRITATION OF MUCOUS MEMBRANES, HEADACHE, NAUSEA,
VOMITING

SKIN CONTACT: IRRITATION

EYE CONTACT: IRRITATION

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: HEADACHE, NAUSEA, VOMITING, DIZZINESS, GASTROINTESTINAL
IRRITATION, CENTRAL NERVOUS SYSTEM DEPRESSION

CHRONIC EFFECTS: KIDNEY DAMAGE, LIVER DAMAGE

TARGET ORGANS

RESPIRATORY SYSTEM, EYES

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY
INDUCE VOMITING.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE
ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE
OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, FLUSH SKIN WITH WATER.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF
WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: NO CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: NO
CERCLA HAZARDOUS SUBSTANCE: NO
SARA 313 TOXIC CHEMICALS: NO
TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

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SECTION VI - REACTIVITY DATA

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STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG BASES, STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: HYDROGEN CHLORIDE, PHOSGENE, CARBON MONOXIDE, CARBON
DIOXIDE

(SPIL) Spillage Disposal:

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SECTION VII - SPILL & DISPOSAL PROCEDURES

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STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D016 (EP TOXIC WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 60 PPM, A CHEMICAL CARTRIDGE RESPIRATOR WITH ORGANIC VAPOR CARTRIDGE IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS RECOMMENDED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, RUBBER GLOVES ARE RECOMMENDED.

(STOR) Storage Procedures:

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SECTION IX - STORAGE AND HANDLING PRECAUTIONS

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SAF-T-DATA* STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

(TRAN) Transportation Information:

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

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DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: DICHLOROPHENOXYACETIC ACID
HAZARD CLASS: ORM-A
UN/NA: NA2765 REPORTABLE QUANTITY: 100 LBS.
LABELS: NONE
REGULATORY REFERENCES: 49CFR 172.101; 173.500; 173.510

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: PHENOXY PESTICIDES, SOLID, TOXIC, N.O.S.
HAZARD CLASS: 6.1 I.M.O. PAGE: 6221
UN: UN2765 MARINE POLLUTANTS: NO PACKAGING GROUP: III
LABELS: HARMFUL - STOW AWAY FROM FOOD STUFFS
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: PHENOXY PESTICIDES, SOLID, TOXIC, N.O.S.
HAZARD CLASS: 6.1
UN: UN2765 PACKAGING GROUP: III
LABELS: HARMFUL - STOW AWAY FROM FOOD STUFFS
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

U.S. CUSTOMS HARMONIZATION NUMBER: 29163300000

EPA/TSCA EXPORT NOTIFICATION

YES

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

(DISC) Disclaimer:

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES. EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL. BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE. THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND

EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

Option?

TYPE 14/2/1

File: 14 Entry: 1

BAKER Accession Number 10305

(MID) Material Identification:

C0066 -04

CADMIUM

EFFECTIVE: 05/01/89

ISSUED: 09/27/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: CADMIUM
COMMON SYNONYMS: N/A
CHEMICAL FAMILY: METALS
FORMULA: CD
FORMULA WT.: 112.40
CAS NO.: 7440-43-9
NIOSH/RTECS NO.: EU9800000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 1182,1184

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (CANCER CAUSING)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	0	NONE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

MAY BE FATAL IF SWALLOWED OR INHALED. EXCEPTIONAL HEALTH HAZARD: READ MATERIAL SAFETY DATA SHEET. NOTE: REPORTED AS CAUSING CANCER IN LABORATORY ANIMALS. EXERCISE DUE CARE.

AVOID CONTACT WITH EYES, SKIN, CLOTHING. AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

INTERNATIONAL LABELING

HARMFUL BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED. POSSIBLE RISKS
OF IRREVERSIBLE EFFECTS.
DO NOT BREATHE DUST.

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

(COMP) Components:

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SECTION II - COMPONENTS

=====

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
CADMIUM	7440-43-9	99-100	.2 MG/M3	.05 MG/M3

(PHYS) Physical Properties:

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SECTION III - PHYSICAL DATA

=====

BOILING POINT: 767 C (1412 F) (AT 760 MM HG)	VAPOR PRESSURE (MMHG): N/A
MELTING POINT: 321 C (609 F) (AT 760 MM HG)	VAPOR DENSITY (AIR=1): 3.9
SPECIFIC GRAVITY: 8.64 (H2O=1)	EVAPORATION RATE: N/A
SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)	% VOLATILES BY VOLUME: 0 (21 C)
PH: N/A	
ODOR THRESHOLD (P.P.M.): N/A	PHYSICAL STATE: SOLID
COEFFICIENT WATER/OIL DISTRIBUTION: N/A	
APPEARANCE & ODOR: BLUE-WHITE SOLID. ODORLESS.	

(FHAZ) Fire Hazards:

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

=====

FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS

CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE OR EXPLOSION.

TOXIC GASES PRODUCED

CADMIUM FUMES

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 0.05 MG/M3

TLV IS FOR CADMIUM, DUSTS AND SALTS, AS CD.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.2 MG/M3

PEL IS FOR CADMIUM DUST, AS CD.

TOXICITY OF COMPONENTS

ORAL RAT LD50 FOR CADMIUM

CARCINOGENICITY: NTP: YES IARC: YES Z LIST: NO OSHA REG: YES 225 MG/KG

CARCINOGENICITY

THIS SUBSTANCE IS LISTED AS A NTP ANTICIPATED HUMAN CARCINOGEN AND AN IARC PROBABLE HUMAN CARCINOGEN (GROUPS 2A AND 2B).

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: IRRITATION OF MUCOUS MEMBRANES, DRYNESS OF MOUTH AND THROAT, HEADACHE, NAUSEA, DIZZINESS, AND MAY BE FATAL
SKIN CONTACT: NONE IDENTIFIED
EYE CONTACT: IRRITATION
SKIN ABSORPTION: NONE IDENTIFIED
INGESTION: IS HARMFUL AND MAY BE FATAL
CHRONIC EFFECTS: LUNG DAMAGE, KIDNEY DAMAGE

TARGET ORGANS

RESPIRATORY SYSTEM, LUNGS, KIDNEYS, BLOOD, PROSTATE

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.
INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.
SKIN CONTACT: IN CASE OF CONTACT, FLUSH SKIN WITH WATER.
EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

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SARA/TITLE III HAZARD CATEGORIES AND LISTS

=====

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: NO

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS CADMIUM (RQ = 1 LB)

SARA 313 TOXIC CHEMICALS: YES CONTAINS CADMIUM

GENERIC CLASS:

C15

TSCA INVENTORY:

YES

STATE LISTS: FOR PRODUCTS SOLD IN THE STATE OF CALIFORNIA, THE STATE REQUIRES THAT WE PROVIDE TO USERS AND THEIR EMPLOYEES THE FOLLOWING MESSAGE: WARNING: THIS PRODUCT IS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG OXIDIZING AGENTS, NITRATES, NITRIC ACID

DECOMPOSITION PRODUCTS: CADMIUM FUMES

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D006 (EP TOXIC WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1 PPM, A HIGH-EFFICIENCY PARTICULATE RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, RUBBER GLOVES ARE
RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA. ISOLATE FROM
INCOMPATIBLE MATERIALS.

(TRAN) Transportation Information:

=====

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

=====

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: POISONOUS SOLIDS, N.O.S. (CADMIUM)
HAZARD CLASS: 6.1 I.M.O. PAGE: 6236
UN: UN2811 MARINE POLLUTANTS: YES PACKAGING GROUP: II
LABELS: POISON
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: POISONOUS SOLIDS, N.O.S. (CADMIUM)
HAZARD CLASS: 6.1
UN: UN2811 PACKAGING GROUP: II

LABELS: POISON
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

U.S. CUSTOMS HARMONIZATION NUMBER: 81071000003

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

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EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.

BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.

THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

Option?

TYPE 15/2/2

File: 15 Entry: 2

BAKER Accession Number 10406

(MID) Material Identification:

C4305 -04

CHROMIUM

EFFECTIVE: 05/01/89

ISSUED: 09/27/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: CHROMIUM
COMMON SYNONYMS: N/A
CHEMICAL FAMILY: METALS
FORMULA: CR
FORMULA WT.: 52.00
CAS NO.: 7440-47-3
NIOSH/RTECS NO.: CB4200000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 4961

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	0	NONE
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	0	NONE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT

U.S. PRECAUTIONARY LABELING

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

INTERNATIONAL LABELING

DO NOT BREATHE DUST.

SAF-T-DATA* STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

(COMP) Components:

=====

SECTION II - COMPONENTS

=====

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
CHROMIUM	7440-47-3	90-100	1 MG/M3	0.5 MG/M3

(PHYS) Physical Properties:

=====

SECTION III - PHYSICAL DATA

=====

BOILING POINT: 2200 C (3992 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): N/A

MELTING POINT: 1900 C (3452 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): N/A

SPECIFIC GRAVITY: 7.14
(H2O=1)

EVAPORATION RATE: N/A

SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)

% VOLATILES BY VOLUME: 0
(21 C)

PH: N/A

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: SOLID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: SILVER OR GRAY PELLETS.

(FHAZ) Fire Hazards:

=====

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

=====

FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA

USE WATER SPRAY, ALCOHOL FOAM, DRY CHEMICAL OR CARBON DIOXIDE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED

BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

CAN BE AN EXPLOSION HAZARD, ESPECIALLY WHEN HEATED.

TOXIC GASES PRODUCED

NONE IDENTIFIED

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 0.5 MG/M3

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 1 MG/M3

TOXICITY OF COMPONENTS

NO INFORMATION IS AVAILABLE

CARCINOGENICITY: NTP: YES IARC: YES Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NOTE: WHILE THE SPECIFIC CHROMIUM COMPOUNDS CANNOT BE IDENTIFIED, THERE IS EVIDENCE THAT CERTAIN CHROMIUM COMPOUNDS CAUSE CANCER IN HUMANS AND EXPERIMENTAL ANIMALS.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: ULCERATION OF MUCOUS MEMBRANES, EXCESSIVE INHALATION IS IRRITATING, MAY CAUSE RESPIRATORY SYSTEM DAMAGE

SKIN CONTACT: SEVERE IRRITATION OR BURNS

EYE CONTACT: SEVERE IRRITATION OR BURNS

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: SEVERE GASTROINTESTINAL IRRITATION, BURNS TO MOUTH AND THROAT

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS

RESPIRATORY SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY

INGESTION, INHALATION

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED PERSON TO FRESH AIR.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH PLENTY OF SOAP AND WATER FOR AT LEAST 15 MINUTES.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: NO

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS CHROMIUM (RQ = 1 LB)

SARA 313 TOXIC CHEMICALS: YES CONTAINS CHROMIUM

GENERIC CLASS: C15

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: FLAME

INCOMPATIBLES: CARBONATES, STRONG BASES, MINERAL ACIDS

DECOMPOSITION PRODUCTS: NONE IDENTIFIED

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D007 (EP TOXIC WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: A RESPIRATOR WITH DUST/MIST FILTER IS RECOMMENDED. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, PROPER GLOVES ARE RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE AREA.

(TRAN) Transportation Information:

=====

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

=====

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)
MARINE POLLUTANTS: NO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)

U.S. CUSTOMS HARMONIZATION NUMBER: 81122000004

N/A = NOT APPLICABLE OR NOT AVAILABLE

N/E = NOT ESTABLISHED

(DISC) Disclaimer:

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OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL. BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.

THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE

NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING
A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL
NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE
(1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

Option?

File: 20 Entry: 3

BAKER Accession Number 10439

(MID) Material Identification:

C5170 -04

COPPER

EFFECTIVE: 05/01/89

ISSUED: 09/27/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: COPPER
COMMON SYNONYMS: BRONZE POWDER; C.I. 77400; ARWOOD COPPER
CHEMICAL FAMILY: METALS
FORMULA: CU
FORMULA WT.: 63.55
CAS NO.: 7440-50-8
NIOSH/RTECS NO.: GL5325000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 1736,1732,1714,1720

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	0	NONE
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	1	SLIGHT

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT

U.S. PRECAUTIONARY LABELING

DURING USE AVOID CONTACT WITH EYES, SKIN, CLOTHING. WASH THOROUGHLY AFTER HANDLING. WHEN NOT IN USE KEEP IN TIGHTLY CLOSED CONTAINER.

INTERNATIONAL LABELING

DO NOT BREATHE DUST.

SAF-T-DATA* STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

(COMP) Components:

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
COPPER	7440-50-8	90-100	1 MG/M3	1 MG/M3

(PHYS) Physical Properties:

SECTION III - PHYSICAL DATA

BOILING POINT: 2595 C (4703 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): N/A

MELTING POINT: 1083 C (1981 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): N/A

SPECIFIC GRAVITY: 8.92
(H2O=1)

EVAPORATION RATE: N/A

SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)

% VOLATILES BY VOLUME: 0
(21 C)

PH: N/A

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: SOLID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: RED METAL. ODORLESS.

(FHAZ) Fire Hazards:

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE. WARNING -
APPLICATION OF WATER TO HOT METAL MAY GENERATE STEAM.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS

DUST MAY FORM EXPLOSIVE MIXTURE WITH AIR.

TOXIC GASES PRODUCED

COPPER FUMES

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 1.0 MG/M3

TLV IS FOR COPPER, DUSTS AND MISTS, AS CU.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 1.0 MG/M3

PEL IS FOR COPPER DUST AND MIST, AS CU.

TOXICITY OF COMPONENTS

NO INFORMATION IS AVAILABLE

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: IRRITATION OF UPPER RESPIRATORY TRACT, HEADACHE, NAUSEA,
VOMITING, DIARRHEA, CHILLS, FEVER, ACHING MUSCLES

SKIN CONTACT: IRRITATION

EYE CONTACT: IRRITATION

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: NAUSEA, VOMITING, DIARRHEA

CHRONIC EFFECTS: DAMAGE TO LIVER, KIDNEYS, LUNGS

TARGET ORGANS

RESPIRATORY SYSTEM, LUNGS, SKIN, LIVER, KIDNEYS

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

WILSON'S DISEASE

PRIMARY ROUTES OF ENTRY

INHALATION, INGESTION, SKIN CONTACT, EYE CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE
LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED
PERSON TO FRESH AIR.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH PLENTY OF
SOAP AND WATER FOR AT LEAST 15 MINUTES.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF
WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: NO

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS COPPER (RQ = 5000 LBS)

SARA 313 TOXIC CHEMICALS: YES CONTAINS COPPER

GENERIC CLASS: C15

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, DUSTING

INCOMPATIBLES: STRONG ACIDS, STRONG OXIDIZING AGENTS, STRONG BASES,
ACETYLENE, ACETALDEHYDE, MAGNESIUM

DECOMPOSITION PRODUCTS: COPPER FUMES

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. CAREFULLY SWEEP UP AND REMOVE.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, PROPER GLOVES ARE RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: ORANGE (GENERAL STORAGE)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. SUITABLE FOR ANY GENERAL CHEMICAL STORAGE

AREA.

(TRAN) Transportation Information:

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

=====

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)
MARINE POLLUTANTS: NO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)

U.S. CUSTOMS HARMONIZATION NUMBER: 74101100006

N/A = NOT APPLICABLE OR NOT AVAILABLE

N/E = NOT ESTABLISHED

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EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.

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REVISE THIS MATERIAL SAFETY DATA SHEET.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

Option?

(MID) Material Identification:

C5175 -03
EFFECTIVE: 05/01/89

COPPER, POWDER

ISSUED: 09/27/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: COPPER, POWDER
COMMON SYNONYMS: BRONZE POWDER; C.I. 77400; ARWOOD COPPER
CHEMICAL FAMILY: METALS
FORMULA: CU
FORMULA WT.: 63.55
CAS NO.: 7440-50-8
NIOSH/RTECS NO.: GL5325000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 1728

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	1	SLIGHT
FLAMMABILITY	-	3	SEVERE (FLAMMABLE)
REACTIVITY	-	0	NONE
CONTACT	-	1	SLIGHT

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; CLASS D EXTINGUISHER

U.S. PRECAUTIONARY LABELING

WARNING

HARMFUL IF INHALED. MAY CAUSE IRRITATION. MAY BE HARMFUL IF SWALLOWED. DUST MAY FORM FLAMMABLE OR EXPLOSIVE MIXTURE WITH AIR. KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING. DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, DO NOT USE WATER. USE DRY SAND, EARTH OR SODA ASH. IN CASE OF SPILL, SWEEP UP AND CAREFULLY REMOVE.

INTERNATIONAL LABELING

DO NOT BREATHE DUST.

SAF-T-DATA* STORAGE COLOR CODE: RED STRIPE (STORE SEPARATELY)

(COMP) Components:

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
COPPER	7440-50-8	90-100	1 MG/M3	1 MG/M3

(PHYS) Physical Properties:

SECTION III - PHYSICAL DATA

BOILING POINT: 2595 C (4703 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): N/A

MELTING POINT: 1083 C (1981 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): N/A

SPECIFIC GRAVITY: 8.92
(H2O=1)

EVAPORATION RATE: N/A

SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)

% VOLATILES BY VOLUME: 0
(21 C)

PH: N/A

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: SOLID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: RED POWDER. ODORLESS.

(FHAZ) Fire Hazards:

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA

SMOTHER WITH DRY SODA ASH. NEVER USE WATER OR CHEMICAL FIRE EXTINGUISHERS.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS

DUST MAY FORM EXPLOSIVE MIXTURE WITH AIR.

TOXIC GASES PRODUCED

COPPER FUMES

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 1.0 MG/M3

TLV IS FOR COPPER, DUSTS AND MISTS, AS CU.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 1.0 MG/M3

PEL IS FOR COPPER DUST AND MIST, AS CU.

TOXICITY OF COMPONENTS

NO INFORMATION IS AVAILABLE

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: IRRITATION OF UPPER RESPIRATORY TRACT, HEADACHE, NAUSEA,
VOMITING, DIARRHEA, CHILLS, FEVER, ACHING MUSCLES

SKIN CONTACT: IRRITATION

EYE CONTACT: IRRITATION

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: NAUSEA, VOMITING, DIARRHEA, GASTROINTESTINAL IRRITATION

CHRONIC EFFECTS: DAMAGE TO LIVER, KIDNEYS, LUNGS

TARGET ORGANS

RESPIRATORY SYSTEM, LUNGS, SKIN, LIVER, KIDNEYS

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

WILSON'S DISEASE

PRIMARY ROUTES OF ENTRY

INHALATION, INGESTION, SKIN CONTACT, EYE CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: IF SWALLOWED AND THE PERSON IS CONSCIOUS, IMMEDIATELY GIVE
LARGE AMOUNTS OF WATER. GET MEDICAL ATTENTION.

INHALATION: IF A PERSON BREATHES IN LARGE AMOUNTS, MOVE THE EXPOSED
PERSON TO FRESH AIR.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY WASH SKIN WITH PLENTY OF
SOAP AND WATER FOR AT LEAST 15 MINUTES.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF
WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: YES PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: NO

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS COPPER (RQ = 5000 LBS)

SARA 313 TOXIC CHEMICALS: YES CONTAINS COPPER

GENERIC CLASS: C15

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, DUSTING

INCOMPATIBLES: STRONG ACIDS, STRONG OXIDIZING AGENTS, STRONG BASES,
ACETYLENE, ACETALDEHYDE, MAGNESIUM

DECOMPOSITION PRODUCTS: COPPER FUMES

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, PROPER GLOVES ARE RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: RED STRIPE (STORE SEPARATELY)

STORAGE REQUIREMENTS

STORE IN A COOL, WELL-VENTILATED AREA AWAY FROM SOURCES OF HEAT, FLAME, OR IGNITION. ISOLATE FROM INCOMPATIBLE MATERIALS.

(TRAN) Transportation Information:

=====

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

=====

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: HAZARDOUS SUBSTANCE, SOLID, N.O.S. (COPPER, POWDER)
HAZARD CLASS: ORM-E
UN/NA: NA9188 REPORTABLE QUANTITY: 5000 LBS.
LABELS: NONE
REGULATORY REFERENCES: 49CFR 172.101; 173.500; 173.510

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)
MARINE POLLUTANTS: NO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: CHEMICALS, N.O.S. (NON-REGULATED)

U.S. CUSTOMS HARMONIZATION NUMBER: 74061000003

N/A = NOT APPLICABLE OR NOT AVAILABLE

N/E = NOT ESTABLISHED

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Option?

TYPE 9/2/6

File: 9 Entry: 6

BAKER Accession Number 10818

(MID) Material Identification:

L2347 -05

LEAD, GRANULAR OR SHOT

EFFECTIVE: 05/01/89

ISSUED: 09/28/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: LEAD, GRANULAR OR SHOT
COMMON SYNONYMS: C.I. 77575
CHEMICAL FAMILY: METALS
FORMULA: PB
FORMULA WT.: 207.20
CAS NO.: 7439-92-1
NIOSH/RTECS NO.: OF7525000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 2256,2266,4996

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (LIFE)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	1	SLIGHT

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

HARMFUL IF INHALED. MAY CAUSE IRRITATION. MAY BE FATAL IF SWALLOWED.
EXCEPTIONAL HEALTH HAZARD: READ MATERIAL SAFETY DATA SHEET.
DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE DUST. KEEP IN
TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY
AFTER HANDLING.

INTERNATIONAL LABELING

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH

PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

(COMP) Components:

SECTION II - COMPONENTS

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
LEAD	7439-92-1	87-99	0.05 MG/M3	0.15 MG/M3
ANTIMONY	7440-36-0	0.5-5	0.5 MG/M3	0.5 MG/M3
ARSENIC	7440-38-2	.01-.5	0.01 MG/M3	0.2 MG/M3

(PHYS) Physical Properties:

SECTION III - PHYSICAL DATA

BOILING POINT: 1744 C (3171 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): N/A

MELTING POINT: 327 C (620 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): N/A

SPECIFIC GRAVITY: 11.3
(H2O=1)

EVAPORATION RATE: N/A

SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)

% VOLATILES BY VOLUME: 0
(21 C)

PH: N/A

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: SOLID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: WHITE TO GRAY METAL. ODORLESS.

(FHAZ) Fire Hazards:

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A

LOWER - N/A

FIRE EXTINGUISHING MEDIA

USE DRY CHEMICAL OR CARBON DIOXIDE. DO NOT USE WATER.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS

NONE IDENTIFIED.

TOXIC GASES PRODUCED

LEAD FUMES

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 0.15 MG/M3

TLV IS FOR LEAD, INORGANIC DUSTS AND FUMES, AS PB.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.05 MG/M3

PEL IS FOR LEAD, INORGANIC DUSTS AND FUMES, AS PB.

TOXICITY OF COMPONENTS

ORAL RAT LD50 FOR ARSENIC 15.1 MG/KG
CARCINOGENICITY: NTP: NO IARC: NO Z LIST: YES OSHA REG: YES

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

EXTREMELY HAZARDOUS SUBSTANCE: NO
CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS LEAD (RQ = 1 LB) AND ANTIMONY (RQ = 5000LBS) AND ARSENIC (RQ = 1 LB)
SARA 313 TOXIC CHEMICALS: YES CONTAINS ANTIMONY, ARSENIC, AND LEAD
GENERIC CLASS: C15
TSCA INVENTORY: YES
STATE LISTS: FOR PRODUCTS SOLD IN THE STATE OF CALIFORNIA, THE STATE REQUIRES THAT WE PROVIDE TO USERS AND THEIR EMPLOYEES THE FOLLOWING MESSAGE: WARNING: THIS PRODUCT IS A CHEMICAL KNOWN TO THE STATE OF CALIFORNIA TO CAUSE BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM.

(HAZR) Hazardous Reactions:

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SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR
CONDITIONS TO AVOID: NONE DOCUMENTED
INCOMPATIBLES: STRONG OXIDIZING AGENTS, POTASSIUM, SODIUM, STRONG ACIDS, STRONG BASES, STRONG REDUCING AGENTS
DECOMPOSITION PRODUCTS: LEAD FUMES

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D008 (EP TOXIC WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.

EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.

BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.

THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

Option?

TYPE 3/2

File 3; Entry 1; Accession No. 10545
(MID) Material Identification:

D7264 -03 M-DINITROBENZENE
EFFECTIVE: 05/01/89

P
ISSUED: 09/27/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: M-DINITROBENZENE
COMMON SYNONYMS: DINITROBENZOL; 1,3-DINITROBENZENE
CHEMICAL FAMILY: AROMATIC HYDROCARBONS
FORMULA: $C_6H_4(NO_2)_2$
FORMULA WT.: 168.11
CAS NO.: 99-65-0
NIOSH/RTECS NO.: CZ7350000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: K264

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (POISON)
FLAMMABILITY	-	1	SLIGHT
REACTIVITY	-	1	SLIGHT
CONTACT	-	3	SEVERE (LIFE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

RAPIDLY ABSORBED THROUGH SKIN. MAY BE FATAL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN. EXCEPTIONAL CONTACT HAZARD: READ MATERIAL SAFETY DATA SHEET. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

INTERNATIONAL LABELING

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

(COMP) Components:

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SECTION II - COMPONENTS

=====

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
M-DINITROBENZENE	99-65-0	90-100	1 MG/M3	1 MG/M3

(PHYS) Physical Properties:

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SECTION III - PHYSICAL DATA

=====

BOILING POINT: 301 C (573 F) (AT 760 MM HG)	VAPOR PRESSURE (MMHG): N/A
MELTING POINT: 88 C (190 F) (AT 760 MM HG)	VAPOR DENSITY (AIR=1): N/A
SPECIFIC GRAVITY: 1.55 (H2O=1)	EVAPORATION RATE: N/A
SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)	% VOLATILES BY VOLUME: N/A (21 C)
PH: N/A	
ODOR THRESHOLD (P.P.M.): N/A	PHYSICAL STATE: SOLID
COEFFICIENT WATER/OIL DISTRIBUTION: N/A	
APPEARANCE & ODOR: YELLOW CRYSTALS. FAINT ODOR.	

(FHAZ) Fire Hazards:

=====

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

=====

FLASH POINT (CLOSED CUP): 149 C (302 F)	NFPA 704M RATING: 3-1-4
AUTOIGNITION TEMPERATURE: N/A	
FLAMMABLE LIMITS: UPPER - N/A	LOWER - N/A
FIRE EXTINGUISHING MEDIA	
USE WATER SPRAY.	

SPECIAL FIRE-FIGHTING PROCEDURES

=====

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. FLUSH AREA WITH WATER UNTIL COOL SO REIGNITION WILL NOT OCCUR.

UNUSUAL FIRE & EXPLOSION HAZARDS

CLOSED CONTAINERS EXPOSED TO HEAT MAY EXPLODE.

TOXIC GASES PRODUCED

OXIDES OF NITROGEN, CARBON MONOXIDE, CARBON DIOXIDE

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 1 MG/M3 (0.15 PPM)

THE TLV LISTED DENOTES TLV (SKIN).

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 1 MG/M3

THE PEL LISTED DENOTES PEL (SKIN).

TOXICITY OF COMPONENTS

ORAL RAT LD50 FOR M-DINITROBENZENE 85 MG/KG
CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: IS HARMFUL MAY BE FATAL, HEADACHE, COUGHING, DIZZINESS,
DIFFICULT BREATHING

SKIN CONTACT: SEVERE IRRITATION OR BURNS

EYE CONTACT: SEVERE IRRITATION OR BURNS

SKIN ABSORPTION: IS HARMFUL AND MAY BE FATAL

INGESTION: NONE IDENTIFIED

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS

BLOOD, LIVER, CARDIOVASCULAR SYSTEM, EYES, CENTRAL NERVOUS SYSTEM

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY

INHALATION, INGESTION, ABSORPTION, EYE CONTACT, SKIN CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY INDUCE VOMITING.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: NO

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS M-DINITROBENZENE (RQ = 100 LBS)

SARA 313 TOXIC CHEMICALS: NO

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

SECTION VI - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION

INCOMPATIBLES: STRONG OXIDIZING AGENTS, STRONG BASES, MOST COMMON METALS

DECOMPOSITION PRODUCTS: OXIDES OF NITROGEN, CARBON MONOXIDE, CARBON DIOXIDE

(SPIL) Spillage Disposal:

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SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: RESPIRATORY PROTECTION REQUIRED IF AIRBORNE CONCENTRATION EXCEEDS TLV. AT CONCENTRATIONS UP TO 1 PPM, A DUST/MIST RESPIRATOR IS RECOMMENDED. ABOVE THIS LEVEL, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, RUBBER GLOVES ARE RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA. DO NOT STORE NEAR OXIDIZING MATERIALS.

(TRAN) Transportation Information:

=====

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

=====

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: DINITROBENZENE, SOLID
HAZARD CLASS: POISON B
UN/NA: UN1597 REPORTABLE QUANTITY: 100 LBS.
LABELS: POISON
REGULATORY REFERENCES: 49CFR 172.101; 173.371

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: DINITROBENZENES
HAZARD CLASS: 6.1
UN: UN1597 MARINE POLLUTANTS: NO
LABELS: POISON
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

I.M.O. PAGE: 6134
PACKAGING GROUP: II

AIR (I.C.A.O.)

PROPER SHIPPING NAME: DINITROBENZENES
HAZARD CLASS: 6.1
UN: UN1597
LABELS: POISON
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

PACKAGING GROUP: II

U.S. CUSTOMS HARMONIZATION NUMBER: 29042060006

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

(DISC) Disclaimer:

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.

EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.

BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS

FOR A PARTICULAR PURPOSE.

THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

Option?

TYPE 8/2/3

File: 8 Entry: 3

BAKER Accession Number 10917

(MID) Material Identification:

M1599 -04

MERCURY (METAL)

EFFECTIVE: 08/28/89

ISSUED: 09/28/91

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SECTION I - PRODUCT IDENTIFICATION

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PRODUCT NAME: MERCURY (METAL)
COMMON SYNONYMS: QUICKSILVER; LIQUID SILVER
CHEMICAL FAMILY: METALS
FORMULA: HG
FORMULA WT.: 200.59
CAS NO.: 7439-97-6
NIOSH/RTECS NO.: OV4550000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 2564,2567,2569,2572

(PHAZ) Primary Hazards:

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PRECAUTIONARY LABELING

=====

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	4	EXTREME (POISON)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	1	SLIGHT
CONTACT	-	3	SEVERE (LIFE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

EXCEPTIONAL CONTACT HAZARD: READ MATERIAL SAFETY DATA SHEET. MAY BE FATAL IF SWALLOWED OR INHALED. EMITS TOXIC VAPORS, ESPECIALLY WHEN HEATED. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

INTERNATIONAL LABELING

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH

PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

(COMP) Components:

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SECTION II - COMPONENTS

=====

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
MERCURY	7439-97-6	90-100	0.05 MG/M3	0.05 MG/M3

THE TLV AND PEL LISTED FOR MERCURY ARE FOR MERCURY VAPOR (SKIN).

(PHYS) Physical Properties:

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SECTION III - PHYSICAL DATA

=====

BOILING POINT: 357 C (674 F)
(AT 760 MM HG)

VAPOR PRESSURE (MMHG): .001
(20 C)

MELTING POINT: -39 C (-38 F)
(AT 760 MM HG)

VAPOR DENSITY (AIR=1): 7.0

SPECIFIC GRAVITY: 13.5
(H2O=1)

EVAPORATION RATE: 4
(BUTYL ACETATE = 1)

SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)

% VOLATILES BY VOLUME: 100
(21 C)

PH: N/A

ODOR THRESHOLD (P.P.M.): N/A

PHYSICAL STATE: LIQUID

COEFFICIENT WATER/OIL DISTRIBUTION: N/A

APPEARANCE & ODOR: SILVERY-WHITE LIQUID METAL.

(FHAZ) Fire Hazards:

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

=====

FLASH POINT (CLOSED CUP): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABLE LIMITS: UPPER - N/A LOWER - N/A

FIRE EXTINGUISHING MEDIA

USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE.

UNUSUAL FIRE & EXPLOSION HAZARDS

NONE IDENTIFIED.

TOXIC GASES PRODUCED

MERCURY

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 0.05 MG/M3

THE TLV LISTED DENOTES TLV (SKIN).

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.05 MG/M3

THE PEL LISTED DENOTES PEL (SKIN).

TOXICITY OF COMPONENTS

NO INFORMATION IS AVAILABLE

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: COUGHING, CHEST PAINS, HEADACHE, NAUSEA, VOMITING,
CENTRAL NERVOUS SYSTEM DEPRESSION, GASTROINTESTINAL
IRRITATION, DIARRHEA, PULMONARY EDEMA, KIDNEY DAMAGE

SKIN CONTACT: IRRITATION, DERMATITIS

EYE CONTACT: IRRITATION

SKIN ABSORPTION: MAY OCCUR

INGESTION: CORROSION OF MOUTH, THROAT, AND STOMACH, GASTROINTESTINAL
PAIN, GASTROINTESTINAL IRRITATION, NAUSEA, VOMITING

CHRONIC EFFECTS: KIDNEY DAMAGE, LIVER DAMAGE, CENTRAL NERVOUS SYSTEM
DEPRESSION, HEADACHE, SHAKES, LOOSE TEETH, IMPAIRED
MEMORY, LOSS OF APPETITE, SKIN ULCERATION, MERCURY
BUILD-UP IN THE BRAIN, LIVER, AND KIDNEYS

TARGET ORGANS

EYES, SKIN, RESPIRATORY SYSTEM, CENTRAL NERVOUS SYSTEM, KIDNEYS, LIVER

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

ALCOHOLISM, KIDNEY DISORDERS

PRIMARY ROUTES OF ENTRY

INHALATION, ABSORPTION, INGESTION, EYE CONTACT, SKIN CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY
INDUCE VOMITING.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE
ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE
OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF
WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED
CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF
WATER FOR AT LEAST 15 MINUTES.

MEDICAL SURVEILLANCE

PROVIDE PREPLACEMENT AND PERIODIC MEDICAL EXAMINATIONS FOR THOSE REGULARLY
EXPOSED TO MERCURY, WITH EMPHASIS ON BLOOD, CENTRAL NERVOUS SYSTEM, SKIN,
LUNGS, LIVER, KIDNEYS, AND GASTROINTESTINAL TRACT.

(REGS) Regulations:

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: NO

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS MERCURY (RQ = 1 LB)

SARA 313 TOXIC CHEMICALS: YES CONTAINS MERCURY

GENERIC CLASS: C15

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

SECTION VI - REACTIVITY DATA

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT

INCOMPATIBLES: STRONG ACIDS, AZIDES, AMMONIA, ALKALI METALS,
ALUMINUM, STRONG OXIDIZING AGENTS, ACETYLENE

DECOMPOSITION PRODUCTS: NONE IDENTIFIED

(SPIL) Spillage Disposal:

SECTION VII - SPILL & DISPOSAL PROCEDURES

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
CLEAN UP SPILL IMMEDIATELY. COLLECT AND STORE USING A SUCTION PUMP WITH A
CAPILLARY TUBE. CALCIUM POLYSULFIDE WITH EXCESS SULFUR SHOULD BE
SPRINKLED INTO CRACKS OR INACCESSIBLE SITES. KEEP COLLECTED MERCURY IN A
TIGHTLY CLOSED BOTTLE FOR RECOVERY OR DISPOSAL.

J.T. BAKER CINNASORB(R) AND RESISORB(R) ARE RECOMMENDED FOR SPILLS OF THIS
PRODUCT.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U151 (TOXIC WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES AND FACE SHIELD, UNIFORM, PROTECTIVE SUIT, RUBBER GLOVES ARE RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA.

(TRAN) Transportation Information:

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SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

=====

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: MERCURY, METALLIC (AIR ONLY)
HAZARD CLASS: ORM-B
UN/NA: NA2809 REPORTABLE QUANTITY: 1 LBS.
LABELS: NONE

REGULATORY REFERENCES: 49CFR 172.101; 173.500; 173.510

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: MERCURY, METAL
HAZARD CLASS: 8
UN: UN2809 MARINE POLLUTANTS: NO
LABELS: CORROSIVE

I.M.O. PAGE: 8182
PACKAGING GROUP: III

REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: MERCURY, METAL
HAZARD CLASS: 8

TYPE 11/2

File 11; Entry 1; Accession No. 11004
(MID) Material Identification:

N2790 -04 NICKEL, SHOT
EFFECTIVE: 05/01/89

ISSUED: 09/28/91

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SECTION I - PRODUCT IDENTIFICATION

=====

PRODUCT NAME: NICKEL, SHOT
COMMON SYNONYMS: N/A
CHEMICAL FAMILY: METALS
FORMULA: NI
FORMULA WT.: 58.71
CAS NO.: 7440-02-0
NIOSH/RTECS NO.: QR5950000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 2748

(PHAZ) Primary Hazards:

=====

PRECAUTIONARY LABELING

=====

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (CANCER CAUSING)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	0	NONE
CONTACT	-	3	SEVERE (LIFE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

WARNING

HARMFUL IF SWALLOWED, INHALED, OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC REACTION. EXCEPTIONAL CONTACT HAZARD: READ MATERIAL SAFETY DATA SHEET. NOTE: REPORTED AS CAUSING CANCER IN LABORATORY ANIMALS. EXERCISE DUE CARE. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. AVOID BREATHING DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

INTERNATIONAL LABELING

TOXIC BY INHALATION AND IF SWALLOWED. MAY CAUSE CANCER.

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED
BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE
MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE
WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL.

UNUSUAL FIRE & EXPLOSION HAZARDS

NONE IDENTIFIED.

TOXIC GASES PRODUCED

NICKEL FUMES

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 1 MG/M3

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 1 MG/M3

TOXICITY OF COMPONENTS

NO INFORMATION IS AVAILABLE

CARCINOGENICITY: NTP: YES IARC: YES Z LIST: NO OSHA REG: NO

CARCINOGENICITY

THIS SUBSTANCE IS LISTED AS A NTP ANTICIPATED HUMAN CARCINOGEN AND AN IARC
PROBABLE HUMAN CARCINOGEN (GROUPS 2A AND 2B).

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: HEADACHE, COUGHING, DIZZINESS, DIFFICULT BREATHING

SKIN CONTACT: PROLONGED CONTACT MAY CAUSE DERMATITIS

EYE CONTACT: NONE IDENTIFIED

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: HEADACHE, NAUSEA, VOMITING, DIZZINESS, GASTROINTESTINAL
IRRITATION

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS

NASAL CAVITIES, LUNGS, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY

INHALATION, INGESTION, EYE CONTACT, SKIN CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, IF CONSCIOUS, IMMEDIATELY
INDUCE VOMITING.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE
ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE
OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF
WATER FOR AT LEAST 15 MINUTES.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF
WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

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SARA/TITLE III HAZARD CATEGORIES AND LISTS

=====

ACUTE: YES CHRONIC: YES FLAMMABILITY: NO PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: YES CONTAINS NICKEL (RQ = 1 LB, TPQ = 10,000
LBS)

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS NICKEL (RQ = 1 LB)

SARA 313 TOXIC CHEMICALS: YES CONTAINS NICKEL

GENERIC CLASS: C15

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: NONE DOCUMENTED

INCOMPATIBLES: STRONG ACIDS, AMMONIA, ALUMINUM, STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: NONE IDENTIFIED

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL ENVIRONMENTAL REGULATIONS.

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, RUBBER GLOVES ARE RECOMMENDED.

(STOR) Storage Procedures:

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SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN SECURE POISON AREA.

File 2; Entry 1; Accession No. 11074
(MID) Material Identification:

P0407 -03 PENTACHLOROPHENOL
EFFECTIVE: 05/01/89 ISSUED: 09/28/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: PENTACHLOROPHENOL
COMMON SYNONYMS: PENTACHLOROPHENATE; 2,3,4,5,6-PENTACHLOROPHENOL
CHEMICAL FAMILY: PHENOLS
FORMULA: CL5C6OH
FORMULA WT.: 266.34
CAS NO.: 87-86-5
NIOSH/RTECS NO.: SM6300000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: S931

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (LIFE)
FLAMMABILITY	-	1	SLIGHT
REACTIVITY	-	0	NONE
CONTACT	-	3	SEVERE (LIFE)

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

CAUSES BURNS. MAY BE FATAL IF SWALLOWED OR ABSORBED THROUGH SKIN. EXCEPTIONAL HEALTH AND CONTACT HAZARDS: READ MATERIAL SAFETY DATA SHEET. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER HANDLING.

INTERNATIONAL LABELING

TOXIC BY INHALATION, IN CONTACT WITH SKIN AND IF SWALLOWED.
AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH PLENTY OF SOAP AND WATER. WEAR

SUITABLE PROTECTIVE CLOTHING AND EYE/SKIN PROTECTION. IF YOU FEEL UNWELL, SEEK MEDICAL ADVICE (SHOW THE LABEL WHERE POSSIBLE). NOT RECOMMENDED FOR INTERIOR USE ON LARGE SURFACE AREAS.

SAF-T-DATA* STORAGE COLOR CODE: BLUE (HEALTH)

(COMP) Components:

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SECTION II - COMPONENTS

=====

COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
PENTACHLOROPHENOL	87-86-5	90-100	0.5 MG/M3	0.5 MG/M3

(PHYS) Physical Properties:

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SECTION III - PHYSICAL DATA

=====

BOILING POINT: 309 C (588 F) (AT 760 MM HG)	VAPOR PRESSURE (MMHG): 0 (20 C)
MELTING POINT: 190 C (374 F) (AT 760 MM HG)	VAPOR DENSITY (AIR=1): 9.2
SPECIFIC GRAVITY: 1.98 (H2O=1)	EVAPORATION RATE: N/A
SOLUBILITY(H2O): NEGLIGIBLE (<0.1%)	% VOLATILES BY VOLUME: 0 (21 C)
PH: N/A	
ODOR THRESHOLD (P.P.M.): N/A	PHYSICAL STATE: SOLID
COEFFICIENT WATER/OIL DISTRIBUTION: N/A	
APPEARANCE & ODOR: WHITE TO BROWN CRYSTALS OR POWDER. ODORLESS.	

(FHAZ) Fire Hazards:

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SECTION IV - FIRE AND EXPLOSION HAZARD DATA

=====

FLASH POINT (CLOSED CUP): N/A	NFPA 704M RATING: 3-0-0
AUTOIGNITION TEMPERATURE: N/A	
FLAMMABLE LIMITS: UPPER - N/A	LOWER - N/A
FIRE EXTINGUISHING MEDIA	
USE EXTINGUISHING MEDIA APPROPRIATE FOR SURROUNDING FIRE.	

GENERIC CLASS:
TSCA INVENTORY:

C04
YES

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT

INCOMPATIBLES: STRONG OXIDIZING AGENTS

DECOMPOSITION PRODUCTS: CHLORINE AND CHLORINE COMPOUNDS, CARBON MONOXIDE,
CARBON DIOXIDE

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. WITH
CLEAN SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND
COVER; REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: U242 (TOXIC WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV
REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS
EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A
DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION
EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED
BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, APRON, RUBBER GLOVES ARE
RECOMMENDED.

(STOR) Storage Procedures:

File 5; Entry 1; Accession No. 11126
(MID) Material Identification:

P4017 -05 PHOSPHORUS, RED, AMORPHOUS
EFFECTIVE: 09/28/89

ISSUED: 09/28/91

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SECTION I - PRODUCT IDENTIFICATION

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PRODUCT NAME: PHOSPHORUS, RED, AMORPHOUS
COMMON SYNONYMS: RED PHOSPHORUS
CHEMICAL FAMILY: PHOSPHORUS AND PHOSPHORUS COMPOUNDS
FORMULA: P
FORMULA WT.: 30.97
CAS NO.: 7723-14-0
NIOSH/RTECS NO.: TH3495000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 9358

(PHAZ) Primary Hazards:

=====

PRECAUTIONARY LABELING

=====

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	0	NONE
FLAMMABILITY	-	2	MODERATE
REACTIVITY	-	2	MODERATE
CONTACT	-	2	MODERATE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS D EXTINGUISHER

U.S. PRECAUTIONARY LABELING

WARNING

COMBUSTIBLE. CAUSES SEVERE IRRITATION.
KEEP AWAY FROM HEAT, SPARKS, FLAME. DO NOT GET IN EYES, ON SKIN, ON CLOTHING.
DO NOT BREATHE DUST. KEEP IN TIGHTLY CLOSED CONTAINER. USE WITH ADEQUATE
VENTILATION. WASH THOROUGHLY AFTER HANDLING. IN CASE OF FIRE, DO NOT USE
WATER. USE DRY SAND, EARTH OR SODA ASH. IN CASE OF SPILL, SWEEP UP AND
CAREFULLY REMOVE.

INTERNATIONAL LABELING

HIGHLY FLAMMABLE. EXPLOSIVE WHEN MIXED WITH OXIDISING SUBSTANCES.

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL. FLUSH AREA WITH WATER UNTIL COOL SO REIGNITION WILL NOT OCCUR.

UNUSUAL FIRE & EXPLOSION HAZARDS

CONTACT WITH STRONG OXIDIZERS MAY CAUSE FIRE OR EXPLOSION.

TOXIC GASES PRODUCED

OXIDES OF PHOSPHORUS

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): NOT ESTABLISHED

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): NOT ESTABLISHED

TOXICITY OF COMPONENTS

NO INFORMATION IS AVAILABLE

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: NONE IDENTIFIED

SKIN CONTACT: SEVERE IRRITATION OR BURNS

EYE CONTACT: SEVERE IRRITATION OR BURNS

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: NONE IDENTIFIED

CHRONIC EFFECTS: NONE IDENTIFIED

TARGET ORGANS

EYES, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY

EYE CONTACT, SKIN CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE WATER, MILK, OR MILK OF MAGNESIA.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. WASH CLOTHING BEFORE RE-USE.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

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SARA/TITLE III HAZARD CATEGORIES AND LISTS

=====

ACUTE: YES CHRONIC: YES FLAMMABILITY: YES PRESSURE: NO REACTIVITY: NO

EXTREMELY HAZARDOUS SUBSTANCE: YES CONTAINS PHOSPHORUS (RQ = 1 LB, TPQ = 100 LBS)

CERCLA HAZARDOUS SUBSTANCE: YES CONTAINS PHOSPHORUS (RQ = 1 LB)

SARA 313 TOXIC CHEMICALS: NO

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: STABLE

HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: FRICTION, HEAT, FLAME, OTHER SOURCES OF IGNITION,
SHOCK

INCOMPATIBLES: STRONG OXIDIZING AGENTS, STRONG BASES

DECOMPOSITION PRODUCTS: NONE IDENTIFIED

(SPIL) Spillage Disposal:

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SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING. SHUT
OFF IGNITION SOURCES; NO FLARES, SMOKING, OR FLAMES IN AREA. WITH CLEAN
SHOVEL, CAREFULLY PLACE MATERIAL INTO CLEAN, DRY CONTAINER AND COVER;
REMOVE FROM AREA. FLUSH SPILL AREA WITH WATER.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D003 (REACTIVE WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE ADEQUATE GENERAL OR LOCAL EXHAUST VENTILATION TO
KEEP FUME OR DUST LEVELS AS LOW AS POSSIBLE.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS
EXIST. IF AIRBORNE CONCENTRATION IS HIGH, USE AN
APPROPRIATE RESPIRATOR OR DUST MASK.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, RUBBER GLOVES ARE
RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: RED STRIPE (STORE SEPARATELY)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN COOL, DRY, WELL-VENTILATED AREA

AWAY FROM HEAT, SPARKS, OR FLAME. DO NOT STORE NEAR OXIDIZING MATERIALS.
KEEP PRODUCT OUT OF LIGHT.

TRAN) Transportation Information:

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: PHOSPHOROUS, AMORPHOUS, RED
HAZARD CLASS: FLAMMABLE SOLID
UN/NA: UN1338 REPORTABLE QUANTITY: 1 LBS.
LABELS: FLAMMABLE SOLID
REGULATORY REFERENCES: 49CFR 172.101; 173.189

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: PHOSPHOROUS, AMORPHOUS, RED
HAZARD CLASS: 4.1
UN: UN1338 MARINE POLLUTANTS: NO
LABELS: FLAMMABLE SOLID
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

I.M.O. PAGE: 4048
PACKAGING GROUP: III

AIR (I.C.A.O.)

PROPER SHIPPING NAME: PHOSPHOROUS, AMORPHOUS, RED
HAZARD CLASS: 4.1
UN: UN1338
LABELS: FLAMMABLE SOLID
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

PACKAGING GROUP: III

U.S. CUSTOMS HARMONIZATION NUMBER: 28047000009

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

(DISC) Disclaimer:

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES. EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE

File 4; Entry 1; Accession No. 11137
(MID) Material Identification:

P4556 -04 PICRIC ACID, WET - 10% MIN. WATER.
EFFECTIVE: 05/01/89

ISSUED: 09/28/91

SECTION I - PRODUCT IDENTIFICATION

PRODUCT NAME: PICRIC ACID, WET - 10% MIN. WATER.
COMMON SYNONYMS: 2,4,6-TRINITROPHENOL; PICRONITRIC ACID; MELINITE
CHEMICAL FAMILY: PHENOLS
FORMULA: 2,4,6-(NO₂)₃C₆H₂OH
FORMULA WT.: 229.11
CAS NO.: 88-89-1
NIOSH/RTECS NO.: TJ7875000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 0276

(PHAZ) Primary Hazards:

PRECAUTIONARY LABELING

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	2	MODERATE
FLAMMABILITY	-	2	MODERATE
REACTIVITY	-	2	MODERATE
CONTACT	-	2	MODERATE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

WARNING

FLAMMABLE SOLID. CAUSES IRRITATION. KEEP WET. EXPLOSIVE IF DRY. HARMFUL IF ABSORBED THROUGH SKIN.
KEEP AWAY FROM HEAT, SPARKS, FLAME. AVOID CONTACT WITH EYES, SKIN, CLOTHING.
KEEP IN TIGHTLY CLOSED CONTAINER. KEEP WET. WASH THOROUGHLY AFTER HANDLING.
THIS MATERIAL CONTAINS AT LEAST 10 % WATER. PICRIC ACID BECOMES AN EXPLOSIVE WHEN DRY. AVOID CONTACT WITH METALS. USE NON-SPARKING TOOLS. IN CASE OF FIRE, SOAK WITH WATER. IN CASE OF SPILL, MOISTEN MATERIAL WITH WATER AND CAREFULLY SWEEP UP AND REMOVE.

INTERNATIONAL LABELING

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH
PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

SAF-T-DATA* STORAGE COLOR CODE: RED (FLAMMABLE)

(COMP) Components:

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SECTION II - COMPONENTS

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COMPONENT	CAS NO.	WEIGHT %	OSHA/PEL	ACGIH/TLV
PICRIC ACID	88-89-1	85-90	0.1 MG/M3	0.1 MG/M3
WATER	7732-18-5	10-15	N/E	N/E

(PHYS) Physical Properties:

=====

SECTION III - PHYSICAL DATA

=====

BOILING POINT: N/A	VAPOR PRESSURE (MMHG): N/A
MELTING POINT: 122 C (251 F) (AT 760 MM HG)	VAPOR DENSITY (AIR=1): N/A
SPECIFIC GRAVITY: 1.77 (H2O=1)	EVAPORATION RATE: N/A
SOLUBILITY(H2O): MODERATE (1-10%)	% VOLATILES BY VOLUME: 10 (21 C)
PH: N/A	
ODOR THRESHOLD (P.P.M.): N/A	PHYSICAL STATE: SOLID
COEFFICIENT WATER/OIL DISTRIBUTION: N/A	
APPEARANCE & ODOR: YELLOW CRYSTALS. ODORLESS.	

(FHAZ) Fire Hazards:

=====

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

=====

FLASH POINT (CLOSED CUP): 149 C (302 F)	NFPA 704M RATING: 2-4-4
AUTOIGNITION TEMPERATURE: 299 C (572 F)	
FLAMMABLE LIMITS: UPPER - N/A	LOWER - N/A
FIRE EXTINGUISHING MEDIA	
USE WATER SPRAY.	

SPECIAL FIRE-FIGHTING PROCEDURES

FIREFIGHTERS SHOULD WEAR PROPER PROTECTIVE EQUIPMENT AND SELF-CONTAINED BREATHING APPARATUS WITH FULL FACEPIECE OPERATED IN POSITIVE PRESSURE MODE. MOVE CONTAINERS FROM FIRE AREA IF IT CAN BE DONE WITHOUT RISK. USE WATER TO KEEP FIRE-EXPOSED CONTAINERS COOL. FLUSH AREA WITH WATER UNTIL COOL SO REIGNITION WILL NOT OCCUR.

UNUSUAL FIRE & EXPLOSION HAZARDS

CAN REACT VIOLENTLY WITH SHOCK, FRICTION OR HEAT. DRY MATERIAL IS AN EXPLOSIVE.

TOXIC GASES PRODUCED

OXIDES OF NITROGEN, CARBON MONOXIDE, CARBON DIOXIDE

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE (TLV/TWA): 0.1 MG/M3

THE TLV LISTED DENOTES TLV (SKIN).

SHORT-TERM EXPOSURE LIMIT (STEL): 0.3 MG/M3

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.1 MG/M3

THE PEL LISTED DENOTES PEL (SKIN).

TOXICITY OF COMPONENTS

INTRAPERITONEAL MOUSE LD50 FOR WATER

190 G/KG

INTRAVENOUS MOUSE LD50 FOR WATER

25 G/KG

CARCINOGENICITY: NTP: NO IARC: NO Z LIST: NO OSHA REG: NO

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION: IRRITATION OF UPPER RESPIRATORY TRACT

SKIN CONTACT: IRRITATION, PROLONGED CONTACT MAY CAUSE DERMATITIS

EYE CONTACT: IRRITATION

SKIN ABSORPTION: NONE IDENTIFIED

INGESTION: HEADACHE, NAUSEA, VOMITING, GASTROINTESTINAL IRRITATION,
CONVULSIONS, UNCONSCIOUSNESS

CHRONIC EFFECTS: DAMAGE TO LIVER, KIDNEYS, AND BLOOD

TARGET ORGANS

KIDNEYS, LIVER, BLOOD, EYES, SKIN

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

NONE IDENTIFIED

PRIMARY ROUTES OF ENTRY

INGESTION, INHALATION, EYE CONTACT, SKIN CONTACT

(AID) First Aid:

EMERGENCY AND FIRST AID PROCEDURES

INGESTION: CALL A PHYSICIAN. IF SWALLOWED, IF CONSCIOUS, GIVE LARGE AMOUNTS OF WATER. INDUCE VOMITING.

INHALATION: IF INHALED, REMOVE TO FRESH AIR. IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN.

SKIN CONTACT: IN CASE OF CONTACT, IMMEDIATELY FLUSH SKIN WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

EYE CONTACT: IN CASE OF EYE CONTACT, IMMEDIATELY FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES.

(REGS) Regulations:

SARA/TITLE III HAZARD CATEGORIES AND LISTS

ACUTE: YES CHRONIC: YES FLAMMABILITY: YES PRESSURE: NO REACTIVITY: YES

EXTREMELY HAZARDOUS SUBSTANCE: NO

CERCLA HAZARDOUS SUBSTANCE: NO

SARA 313 TOXIC CHEMICALS: YES CONTAINS PICRIC ACID

GENERIC CLASS: C08

TSCA INVENTORY: YES

(HAZR) Hazardous Reactions:

=====

SECTION VI - REACTIVITY DATA

=====

STABILITY: UNSTABLE HAZARDOUS POLYMERIZATION: WILL NOT OCCUR

CONDITIONS TO AVOID: HEAT, FLAME, OTHER SOURCES OF IGNITION, SHOCK, DRYNESS

INCOMPATIBLES: MOST COMMON METALS, STRONG BASES, AMMONIA, STRONG
 REDUCING AGENTS, STRONG OXIDIZING AGENTS, CONCRETE,
 PLASTER

DECOMPOSITION PRODUCTS: OXIDES OF NITROGEN, CARBON MONOXIDE, CARBON DIOXIDE

(SPIL) Spillage Disposal:

=====

SECTION VII - SPILL & DISPOSAL PROCEDURES

=====

STEPS TO BE TAKEN IN THE EVENT OF A SPILL OR DISCHARGE

WEAR SUITABLE PROTECTIVE CLOTHING. SHUT OFF IGNITION SOURCES; NO FLARES,
SMOKING, OR FLAMES IN AREA.
MOISTEN MATERIAL WITH WATER AND PLACE IT INTO LOOSELY-COVERED PLASTIC OR
FIBERBOARD CONTAINERS FOR LATER DISPOSAL.

DISPOSAL PROCEDURE

DISPOSE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE, AND LOCAL
ENVIRONMENTAL REGULATIONS.

EPA HAZARDOUS WASTE NUMBER: D001, D003 (IGNITABLE, REACTIVE WASTE)

(EQP) Protective Equipment:

=====

SECTION VIII - INDUSTRIAL PROTECTIVE EQUIPMENT

=====

VENTILATION: USE GENERAL OR LOCAL EXHAUST VENTILATION TO MEET TLV
 REQUIREMENTS.

RESPIRATORY PROTECTION: NONE REQUIRED WHERE ADEQUATE VENTILATION CONDITIONS
 EXIST. IF AIRBORNE CONCENTRATION EXCEEDS TLV, A
 DUST/MIST RESPIRATOR IS RECOMMENDED. IF CONCENTRATION
 EXCEEDS CAPACITY OF RESPIRATOR, A SELF-CONTAINED
 BREATHING APPARATUS IS ADVISED.

EYE/SKIN PROTECTION: SAFETY GOGGLES, UNIFORM, RUBBER GLOVES ARE
 RECOMMENDED.

(STOR) Storage Procedures:

=====

SECTION IX - STORAGE AND HANDLING PRECAUTIONS

=====

SAF-T-DATA* STORAGE COLOR CODE: RED (FLAMMABLE)

STORAGE REQUIREMENTS

KEEP CONTAINER TIGHTLY CLOSED. STORE IN COOL, DRY, WELL-VENTILATED AREA AWAY FROM HEAT, SPARKS, OR FLAME. ISOLATE FROM INCOMPATIBLE MATERIALS.

SPECIAL PRECAUTIONS

THIS PRODUCT CONTAINS AT LEAST 10% WATER - IF THE WATER CONTENT DECREASES BELOW THIS LEVEL, PICRIC ACID BECOMES AN EXPLOSIVE. AVOID CONDITIONS THAT COULD LEAD TO LOSS OF WATER.

(TRAN) Transportation Information:

=====

SECTION X - TRANSPORTATION DATA AND ADDITIONAL INFORMATION

=====

DOMESTIC (D.O.T.)

PROPER SHIPPING NAME: PICRIC ACID, WET, WITH NOT LESS THAN 10% WATER
HAZARD CLASS: FLAMMABLE SOLID
UN/NA: NA1344
LABELS: FLAMMABLE SOLID
REGULATORY REFERENCES: 49CFR 172.101; 173.193

INTERNATIONAL (I.M.O.)

PROPER SHIPPING NAME: TRINITROPHENOL, WETTED WITH NOT LESS THAN 10% WATER, BY WEIGHT
HAZARD CLASS: 4.1 I.M.O. PAGE: 4053
UN: UN1344 MARINE POLLUTANTS: NO PACKAGING GROUP: III
LABELS: FLAMMABLE SOLID
REGULATORY REFERENCES: 49CFR 172.102; PART 176; IMO

AIR (I.C.A.O.)

PROPER SHIPPING NAME: TRINITROPHENOL, WETTED WITH NOT LESS THAN 10% WATER, BY WEIGHT
HAZARD CLASS: 4.1
UN: UN1344 PACKAGING GROUP: III
LABELS: FLAMMABLE SOLID
REGULATORY REFERENCES: 49CFR 172.101; 173.6; PART 175; ICAO/IATA

U.S. CUSTOMS HARMONIZATION NUMBER: 29089000000

N/A = NOT APPLICABLE OR NOT AVAILABLE
N/E = NOT ESTABLISHED

(DISC) Disclaimer:

THE INFORMATION IN THIS MATERIAL SAFETY DATA SHEET MEETS THE REQUIREMENTS OF THE UNITED STATES OCCUPATIONAL SAFETY AND HEALTH ACT AND REGULATIONS PROMULGATED THEREUNDER (29 CFR 1910.1200 ET. SEQ.) AND THE CANADIAN WORKPLACE HAZARDOUS MATERIALS INFORMATION SYSTEM. THIS DOCUMENT IS INTENDED ONLY AS A GUIDE TO THE APPROPRIATE PRECAUTIONARY HANDLING OF THE MATERIAL BY A PERSON TRAINED IN, OR SUPERVISED BY A PERSON TRAINED IN, CHEMICAL HANDLING. THE USER IS RESPONSIBLE FOR DETERMINING THE PRECAUTIONS AND DANGERS OF THIS CHEMICAL FOR HIS OR HER PARTICULAR APPLICATION. DEPENDING ON USAGE, PROTECTIVE CLOTHING INCLUDING EYE AND FACE GUARDS AND RESPIRATORS MUST BE USED TO AVOID CONTACT WITH MATERIAL OR BREATHING CHEMICAL VAPORS/FUMES.

EXPOSURE TO THIS PRODUCT MAY HAVE SERIOUS ADVERSE HEALTH EFFECTS. THIS CHEMICAL MAY INTERACT WITH OTHER SUBSTANCES. SINCE THE POTENTIAL USES ARE SO VARIED, BAKER CANNOT WARN OF ALL OF THE POTENTIAL DANGERS OF USE OR INTERACTION WITH OTHER CHEMICALS OR MATERIALS. BAKER WARRANTS THAT THE CHEMICAL MEETS THE SPECIFICATIONS SET FORTH ON THE LABEL.

BAKER DISCLAIMS ANY OTHER WARRANTIES, EXPRESSED OR IMPLIED WITH REGARD TO THE PRODUCT SUPPLIED HEREUNDER, ITS MERCHANTABILITY OR ITS FITNESS FOR A PARTICULAR PURPOSE.

THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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APPROVED BY QUALITY ASSURANCE DEPARTMENT.

Option?

File 12; Entry 1; Accession No. 11278
(MID) Material Identification:

S1106 -02 SELENIUM
EFFECTIVE: 05/01/89 ISSUED: 09/28/91
=====

SECTION I - PRODUCT IDENTIFICATION
=====

PRODUCT NAME: SELENIUM
COMMON SYNONYMS: ELEMENTAL SELENIUM; SELENIUM DUST; SELENIUM HOMOPOLYMER
CHEMICAL FAMILY: METALS
FORMULA: SE
FORMULA WT.: 78.96
CAS NO.: 7782-49-2
NIOSH/RTECS NO.: VS7700000
PRODUCT USE: LABORATORY REAGENT
PRODUCT CODES: 3395

(PHAZ) Primary Hazards:
=====

PRECAUTIONARY LABELING
=====

BAKER SAF-T-DATA* SYSTEM

HEALTH	-	3	SEVERE (LIFE)
FLAMMABILITY	-	0	NONE
REACTIVITY	-	1	SLIGHT
CONTACT	-	2	MODERATE

LABORATORY PROTECTIVE EQUIPMENT

GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES

U.S. PRECAUTIONARY LABELING

POISON DANGER

CAUSES IRRITATION. HARMFUL IF SWALLOWED OR INHALED. EXCEPTIONAL HEALTH HAZARD:
READ MATERIAL SAFETY DATA SHEET.
AVOID CONTACT WITH EYES, SKIN, CLOTHING. DO NOT BREATHE DUST. KEEP IN TIGHTLY
CLOSED CONTAINER. USE WITH ADEQUATE VENTILATION. WASH THOROUGHLY AFTER
HANDLING.

INTERNATIONAL LABELING

AVOID CONTACT WITH EYES. AFTER CONTACT WITH SKIN, WASH IMMEDIATELY WITH
PLENTY OF WATER. KEEP CONTAINER TIGHTLY CLOSED.

SPECIAL FIRE-FIGHTING PROCEDURES

NONE IDENTIFIED.

UNUSUAL FIRE & EXPLOSION HAZARDS

NONE IDENTIFIED.

TOXIC GASES PRODUCED

NONE IDENTIFIED

EXPLOSION DATA-SENSITIVITY TO MECHANICAL IMPACT

NONE IDENTIFIED.

EXPLOSION DATA-SENSITIVITY TO STATIC DISCHARGE

NONE IDENTIFIED.

(HAZH) Health Hazards:

=====

SECTION V - HEALTH HAZARD DATA

=====

THRESHOLD LIMIT VALUE (TLV/TWA): 0.2 MG/M3

TLV IS FOR SELENIUM COMPOUNDS, AS SE.

SHORT-TERM EXPOSURE LIMIT (STEL): NOT ESTABLISHED

PERMISSIBLE EXPOSURE LIMIT (PEL): 0.2 MG/M3

PEL IS FOR SELENIUM COMPOUNDS, AS SE.

TOXICITY OF COMPONENTS

ORAL RAT LD50 FOR SELENIUM

INTRAVENOUS RAT LD50 FOR SELENIUM

CARCINOGENICITY: NTP: NO

IARC: NO

Z LIST: NO

OSHA REG: NO

6700 MG/KG

6 MG/KG

CARCINOGENICITY

NONE IDENTIFIED.

REPRODUCTIVE EFFECTS

NONE IDENTIFIED.

EFFECTS OF OVEREXPOSURE

INHALATION:

IRRITATION OF NOSE AND THROAT

SKIN CONTACT:

IRRITATION, PROLONGED CONTACT MAY CAUSE DERMATITIS

EYE CONTACT:

IRRITATION

THE USER SHOULD RECOGNIZE THAT THIS PRODUCT CAN CAUSE SEVERE INJURY AND EVEN DEATH, ESPECIALLY IF IMPROPERLY HANDLED OR THE KNOWN DANGERS OF USE ARE NOT HEEDED. READ ALL PRECAUTIONARY INFORMATION. AS NEW DOCUMENTED GENERAL SAFETY INFORMATION BECOMES AVAILABLE, BAKER WILL PERIODICALLY REVISE THIS MATERIAL SAFETY DATA SHEET.

NOTE: CHEMTREC, CANUTEC, AND NATIONAL RESPONSE CENTER EMERGENCY TELEPHONE NUMBERS ARE TO BE USED ONLY IN THE EVENT OF CHEMICAL EMERGENCIES INVOLVING A SPILL, LEAK, FIRE, EXPOSURE, OR ACCIDENT INVOLVING CHEMICALS. ALL NON-EMERGENCY QUESTIONS SHOULD BE DIRECTED TO CUSTOMER SERVICE (1-800-JTBAKER) FOR ASSISTANCE.

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Option?

APPENDIX E
FORMS

(For Safety Staff only)	REPORT NO.	EROC CODE	UNITED STATES ARMY CORPS OF ENGINEERS ACCIDENT INVESTIGATION REPORT (For Use of this Form See Attached Instructions and USACE Suppl to AR 385-40)		REQUIREMENT CONTROL SYMBOL: CEEC-S-8(R2)
1. ACCIDENT CLASSIFICATION					
PERSONNEL CLASSIFICATION		INJURY/ILLNESS/FATAL		PROPERTY DAMAGE	MOTOR VEHICLE INVOLVED
GOVERNMENT <input type="checkbox"/> CIVILIAN <input type="checkbox"/> MILITARY		<input type="checkbox"/>		<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>
<input type="checkbox"/> CONTRACTOR		<input type="checkbox"/>		<input type="checkbox"/> FIRE INVOLVED <input type="checkbox"/> OTHER	<input type="checkbox"/>
<input type="checkbox"/> PUBLIC		<input type="checkbox"/> FATAL <input type="checkbox"/> OTHER		X	
2. PERSONAL DATA					
a. NAME (Last,First,MI)		b. AGE	c. SEX <input type="checkbox"/> MALE <input type="checkbox"/> FEMALE	d. SOCIAL SECURITY NUMBER	
f. JOB SERIES/TITLE		g. DUTY STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ON DUTY <input type="checkbox"/> TOY <input type="checkbox"/> OFF DUTY		h. EMPLOYMENT STATUS AT TIME OF ACCIDENT <input type="checkbox"/> ARMY ACTIVE <input type="checkbox"/> ARMY RESERVE <input type="checkbox"/> VOLUNTEER <input type="checkbox"/> PERMANENT <input type="checkbox"/> FOREIGN NATIONAL <input type="checkbox"/> SEASONAL <input type="checkbox"/> TEMPORARY <input type="checkbox"/> STUDENT <input type="checkbox"/> OTHER (Specify)	
3. GENERAL INFORMATION					
a. DATE OF ACCIDENT (month/day/year)		b. TIME OF ACCIDENT (Military time)		c. EXACT LOCATION OF ACCIDENT	
e. CONTRACT NUMBER <input type="checkbox"/> CIVIL WORKS <input type="checkbox"/> MILITARY <input type="checkbox"/> OTHER (Specify)		f. TYPE OF CONTRACT <input type="checkbox"/> CONSTRUCTION <input type="checkbox"/> SERVICE <input type="checkbox"/> A/E <input type="checkbox"/> DREDGE <input type="checkbox"/> OTHER (Specify)		g. HAZARDOUS/TOXIC WASTE ACTIVITY <input type="checkbox"/> SUPERFUND <input type="checkbox"/> DERP <input type="checkbox"/> IRP <input type="checkbox"/> OTHER (Specify)	
d. CONTRACTOR'S NAME (1) PRIME: (2) SUBCONTRACTOR:					
4. CONSTRUCTION ACTIVITIES ONLY (Fill in line and corresponding code number in box from list - see instructions)					
a. CONSTRUCTION ACTIVITY (CODE)			b. TYPE OF CONSTRUCTION EQUIPMENT (CODE)		
#			#		
5. INJURY / ILLNESS INFORMATION (Include name on line and corresponding code number in box for items e, f & g - see instructions)					
a. SEVERITY OF ILLNESS / INJURY (CODE)			b. ESTIMATED DAYS LOST	c. ESTIMATED DAYS HOSPITALIZED	d. ESTIMATED DAYS RESTRICTED DUTY
#					
e. BODY PART AFFECTED (CODE)			g. TYPE AND SOURCE OF INJURY/ILLNESS		
PRIMARY #			TYPE #		
SECONDARY #			SOURCE #		
f. NATURE OF ILLNESS / INJURY (CODE)					
#					
6. PUBLIC FATALITY (Fill in line and corresponding code number in box - see instructions)					
a. ACTIVITY AT TIME OF ACCIDENT (CODE)			b. PERSONAL FLOATATION DEVICE USED?		
#			<input type="checkbox"/> YES <input type="checkbox"/> NO <input type="checkbox"/> N/A		
7. MOTOR VEHICLE ACCIDENT					
a. TYPE OF VEHICLE		b. TYPE OF COLLISION		c. SEAT BELTS	USED NOT USED NOT AVAILABLE
<input type="checkbox"/> PICKUP/VAN <input type="checkbox"/> AUTOMOBILE <input type="checkbox"/> TRUCK <input type="checkbox"/> OTHER (Specify)		<input type="checkbox"/> SIDE SWIPE <input type="checkbox"/> HEAD ON <input type="checkbox"/> REAR END <input type="checkbox"/> BROADSIDE <input type="checkbox"/> ROLL OVER <input type="checkbox"/> BACKING <input type="checkbox"/> OTHER (Specify)		(1) FRONT SEAT	
				(2) REAR SEAT	
8. PROPERTY/MATERIAL INVOLVED					
a. NAME OF ITEM		b. OWNERSHIP		c. \$ AMOUNT OF DAMAGE	
(1)					
(2)					
(3)					
9. VESSEL / FLOATING PLANT ACCIDENT (Fill in line and corresponding code number in box from list - see instructions)					
a. TYPE OF VESSEL/FLOATING PLANT (CODE)			b. TYPE OF COLLISION/MISHAP (CODE)		
#			#		
10. ACCIDENT DESCRIPTION (Use additional paper, if necessary)					

11. CAUSAL FACTOR(S) (Read Instruction Before Completing)					
a. (Explain YES answers in item 13) DESIGN: Was design of facility, workplace or equipment a factor? YES NO <input type="checkbox"/> <input type="checkbox"/> INSPECTION/MAINTENANCE: Were inspection & maintenance procedures a factor? YES NO <input type="checkbox"/> <input type="checkbox"/> PERSON'S PHYSICAL CONDITION: In your opinion, was the physical condition of the person a factor? YES NO <input type="checkbox"/> <input type="checkbox"/> OPERATING PROCEDURES: Were operating procedures a factor? YES NO <input type="checkbox"/> <input type="checkbox"/> JOB PRACTICES: Were any job safety/health practices not followed when the accident occurred? YES NO <input type="checkbox"/> <input type="checkbox"/> HUMAN FACTORS: Did any human factors such as, size or strength of person, etc., contribute to accident? YES NO <input type="checkbox"/> <input type="checkbox"/> ENVIRONMENTAL FACTORS: Did heat, cold, dust, sun, glare, etc., contribute to the accident? YES NO <input type="checkbox"/> <input type="checkbox"/>		a. (CONTINUED) CHEMICAL AND PHYSICAL AGENT FACTORS: Did exposure to chemical agents, such as dust, fumes, mists, vapors or physical agents, such as, noise, radiation, etc., contribute to accident? YES NO <input type="checkbox"/> <input type="checkbox"/> OFFICE FACTORS: Did office setting such as, lifting office furniture, carrying, stooping, etc., contribute to the accident? YES NO <input type="checkbox"/> <input type="checkbox"/> SUPPORT FACTORS: Were inappropriate tools/resources provided to properly perform the activity/task? YES NO <input type="checkbox"/> <input type="checkbox"/> PERSONAL PROTECTIVE EQUIPMENT: Did the improper selection, use or maintenance of personal protective equipment contribute to the accident? YES NO <input type="checkbox"/> <input type="checkbox"/> DRUGS/ALCOHOL: In your opinion, was drugs or alcohol a factor to the accident? YES NO <input type="checkbox"/> <input type="checkbox"/>			
b. WAS A WRITTEN JOB/ACTIVITY HAZARD ANALYSIS COMPLETED FOR TASK BEING PERFORMED AT TIME OF ACCIDENT? <input type="checkbox"/> YES (If yes, attach a copy.) <input type="checkbox"/> NO					
12. TRAINING					
a. WAS PERSON TRAINED TO PERFORM ACTIVITY/TASK? <input type="checkbox"/> YES <input type="checkbox"/> NO		b. TYPE OF TRAINING. <input type="checkbox"/> CLASSROOM <input type="checkbox"/> ON JOB		c. DATE OF MOST RECENT FORMAL TRAINING. <div style="text-align: center;">/ /</div> <div style="text-align: center;">(Month) (Day) (Year)</div>	
13. FULLY EXPLAIN WHAT ALLOWED OR CAUSED THE ACCIDENT; INCLUDE DIRECT AND INDIRECT CAUSES (See instruction for definition of direct and indirect causes.) (Use additional paper, if necessary)					
a. DIRECT CAUSE <div style="height: 20px; border: 1px solid black;"></div>					
b. INDIRECT CAUSE(S) <div style="height: 20px; border: 1px solid black;"></div>					
14. ACTION(S) TAKEN, ANTICIPATED OR RECOMMENDED TO ELIMINATE CAUSE(S).					
DESCRIBE FULLY:					
15. DATES FOR ACTIONS IDENTIFIED IN BLOCK 14.					
a. BEGINNING (Month/Day/Year) / /			b. ANTICIPATED COMPLETION (Month/Day/Year) / /		
c. SIGNATURE AND TITLE OF SUPERVISOR COMPLETING REPORT CORPS _____ CONTRACTOR _____		d. DATE (Mo/Da/Yr) <div style="text-align: center;">_ / _ / _</div>		e. ORGANIZATION IDENTIFIER (Div, Br, Sect)	
f. OFFICE SYMBOL <div style="height: 20px; border: 1px solid black;"></div>					
16. MANAGEMENT REVIEW (1st).					
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. COMMENTS <div style="height: 20px; border: 1px solid black;"></div>					
SIGNATURE		TITLE		DATE	
17. MANAGEMENT REVIEW (2nd - Chief Operations, Construction, Engineering, etc.)					
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. COMMENTS <div style="height: 20px; border: 1px solid black;"></div>					
SIGNATURE		TITLE		DATE	
18. SAFETY AND OCCUPATIONAL HEALTH OFFICE REVIEW					
a. <input type="checkbox"/> CONCUR b. <input type="checkbox"/> NON CONCUR c. ADDITIONAL ACTIONS/COMMENTS: <div style="height: 20px; border: 1px solid black;"></div>					
SIGNATURE		TITLE		DATE	
19. COMMAND APPROVAL					
COMMENTS					
COMMANDER SIGNATURE				DATE	

Standard Number T.00.020
Revision Date 07/01/92
Origin Date 11/13/91
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SEC DONOHUE INC.
EMPLOYEE INJURY/EXPOSURE INCIDENT REPORT
(Submit to RHSS within 24 hours)

Date: _____

Employee: _____ Employee No. _____

Site Name: _____

Site Location: _____

Project No.: _____

Exposure (yes or no): _____ Injury (yes or no) _____

Date of Incident: _____ Time: _____

Location: _____

Activity During Time of Incident: _____

Site Conditions at Time of Incident:

Temperature _____ Wind Speed _____

Humidity _____ Other _____

Precipitation _____

Cause of Exposure/Injury: _____

Type of Exposure/Injury: _____

Material Exposed to and Concentration Levels: _____

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Nature of Exposure/Injury (part of body, etc.): _____

Hospital and Attending Physician: _____

Medical Care Received (on-site and off): _____

Other Individuals Involved: _____

Witnesses: _____

Has RHSS Been Notified: _____ No _____ Yes (Attach Documentation)

Incident Report Completed by: _____

D/MASTERS/AF6 E:082692

TRAINING ATTENDANCE SHEET

Course Title _____

Text/Audio Visual Title _____

Date(s) Presented _____ Duration (hours) _____

Instructors Name (print) _____

Attendees:

Name (print)	Signature	Organization/Company Name	S.S. Number

Instructor's Signature _____ Date _____

RESPIRATOR SELECTION CHECKLIST

- A. Project Identifier _____
 B. Address or Location _____
 C. Contaminants: _____

Name of Contaminant	Concentration (Air, Water, or Soil)	Limit (PEL/TLV)	Physical State (Particulate, Dust, Mist, Fume, Vapor)	Physiological Effects (NIOSH Guide)	Irritation Threshold

D. Scope of Work

1. Hazardous Process Characteristics: _____

2. Work Area Characteristics: _____

3. Hazardous Materials Used or Potentially Produced: _____

4. Worker Duties and Actions: _____

5. Potential Abnormal Situation: _____

6. Location of Dearest Respirable Air: _____

7. Worker Activities: _____

E. Is it an IDLH atmosphere?

If yes, state reason or justification, list the contaminant or component and give the IDLH concentration.

F. List any problems that may be encountered due to the chemical incompatibility of a contaminant with other compounds, potential hazardous decomposition products, many synergistic or additive effects.

G. List any applicable comprehensive health standard(s).

H. Selected Respirator

1) Type: _____

2) Protection Factor: _____

3) Hazard Ratio: _____

4) Cartridge or Filter Type: _____

5) Special Requirements: _____

I. Signature

Health and Safety Manager

Date

Program Manager

Date

APPENDIX F
DRILLING HEALTH AND SAFETY PLAN

SEC DONOHUE, INC.
DRILLING HEALTH, and SAFETY PLAN
For Operation of Small Auger, Rotary, and Coring Rigs

All work assigned under this subcontract or purchase order shall be conducted in accordance with the established safety regulations of Occupational Safety, and Health Administration (OSHA), and other applicable Federal, State, County, and City regulations. The full set of OSHA Standards are available for inspection, and/or questions at the SEC Donohue, Inc., Health, Safety, and Security Section, Grand Junction, Colorado. Compliance inspections will be made by SEC Donohue, Inc., Health, Safety, and Security personnel.

All personnel, including SEC Donohue, Inc., Subcontractor, lower tier Subcontractors, consultants, and service personnel, who perform any task in relation to the drilling efforts or are visitors to the drilling site(s) must adhere to the provisions of this Plan.

A formal notice of employee rights, and obligations is a vital part of this program, and must be posted near the job site. The OSHA poster is required to be posted, and shall be accessible by all employees.

The safety of all personnel takes priority over all other aspects of the drilling project. All personnel, including SEC Donohue, Inc., Subcontractor, and site visitor(s) shall receive daily safety instruction, and information regarding potential safety hazards at the site. Such daily training will be documented in the project records. All visitors will be escorted by a SEC Donohue, Inc., representative during their presence at the drilling site(s). SEC Donohue, Inc., personnel will suspend all drilling operations when an unsafe practice or condition is observed. Drilling will not proceed until the unsafe practice or condition is corrected. The Subcontractor shall not be compensated for efforts required to correct any unsafe act or unsafe condition created by his actions.

All personnel (including replacement, and/or additional) working on this project must have met the minimum training requirements as set forth in the Statement of Work developed for the project. Each individual's training must be documented prior to that person performing any work on the project.

The Subcontractor is responsible for safe operations of his Subcontractor(s), who are also subject to all provisions of this Plan. Any injury/illness that occurs as a direct result of work being performed under this subcontract or purchase order requires an accident report covering the incident. The accident report is to be submitted to SEC Donohue, Inc., Health, Safety, and Security within one working day of the accident.

The Subcontractor must have a written, and functional safety program to protect site workers, the general public, and the environment. Before work commences, a safety management program, and implementation plan which includes, but is not limited to, the following must have been reviewed, and approved in writing by SEC Donohue, Inc., Health, Safety, and

Security. The scope of the program will be determined by the size, and complexity of the project, and the recognizable hazards of the work to be performed.

The minimum areas to be covered are as follows:

1. **The Drill Rig Operator.** The drill rig operator should consider the responsibility for safety, and the authority to enforce safety to be a matter for first importance.
 - The drill rig operator shall be the leader in using proper personal safety gear, and set an example in adhering to the rules, and regulations that are set forth for the project.
 - The drill rig operator shall enforce the use of proper personal protective safety equipment, and take appropriate corrective action when proper personal protective safety equipment is not being used.
 - The drill rig operator, and crew should understand that proper maintenance of tools, and equipment, and general housekeeping on the drill rig will provide the environment to promote, and enforce safety.
 - The drill rig operator shall inspect the rig to insure that the required safety devices, (e.g., safety engine shut-down switches) are installed and functional. The drill rig operator shall inspect the rig to insure that applicable safety placards are installed at potential safety hazard locations as recommended by the manufacturer.
 - Before drilling is started with a particular drill, it will be assured that the operator has had adequate training, and is thoroughly familiar with the drill rig, its controls, its capabilities, and operating parameters.
 - The drill rig operator will inspect the drill rig at least daily for structural damage, loose bolts, and nuts, proper tension in chain drives, loose or missing guards or protective covers, fluid leaks, damaged pressure gauges, and pressure relief valves.
 - The drill rig operator will check, and test all safety devices such as emergency shut-down switches at least daily, and preferably at the start of a drilling shift.
 - The drill rig operator shall check that all gauges, warning lights, and control levers are functioning properly, and listen for unusual sounds on each starting of an engine.
 - The drill rig operator shall assure that all new drill rig workers are informed of safe operating practices on, and around the drill rig. The drill rig operator shall assure that each new employee understands the safety requirements, and document the new employee's acceptance of the requirements.
 - The drill rig operator shall observe the mental, emotional, and physical capability of each worker to perform the assigned work in a proper, and safe manner. No person who is obviously impaired to the point of being detrimental to safety will be allowed to work on the rig.
 - The drill rig operator shall assure that there is a fully stocked first-aid kit, and OSHA/DOT- approved fire extinguisher on the rig.
 - The drill rig operator (and as many crew members as possible) shall be well trained, and capable of using first-aid kits, fire extinguishers, and all other safety devices, and equipment.

- The drill rig operator will maintain a list of addresses, and telephone numbers of emergency assistance units (ambulance services, police, hospitals, etc.), and inform other members of the drill crew of the existence, location, and proper use of the list.

2. Individual Protective Equipment

Assure that personal protective equipment (PPE) provided meets NIOSH/ANSI specifications.

- Clothing. Workers shall wear clothing which is close-fitting but comfortable, without loose ends, straps, draw strings, belts, or otherwise unfastened parts that might catch on some rotating or moving component of the drill.
- Safety Head Gear. Safety hats (hard hats) will be worn by everyone working or visiting at or near a drill site.
- Safety Shoes or Boots. Safety shoes or boots should be worn by all drilling personnel, and all visitors to the drill site that observe drilling operations within close proximity of the drill rig.
- Safety Glasses. All drilling personnel, and visitors to the drill site are required to wear approved safety glasses or goggles while the drill rig is in operation or other drilling functions are being performed. Prescription glasses shall be an approved safety type or goggles must be used.
- Gloves. All drilling personnel shall wear gloves for protection against cuts, and abrasion which could occur while handling wire rope or cable, and from contact with sharp edges, and burrs on drill rods, and other drilling or sampling tools.
- Other Protective Equipment. For some drilling operations, the environment or regulations may dictate that other protective equipment be used. Each drill rig worker should wear noise reducing ear protectors when appropriate. When drilling is performed in chemically or radiologically contaminated ground, special protective equipment, and clothing may, and probably will, be required.

3. Housekeeping On and Around the Drill Rig

- Suitable storage locations should be provided for all tools, materials, and supplies so that they may be conveniently and safely handled without hitting or falling on a member of the drill crew or a visitor.
- Avoid storing or transporting tools, materials, or supplies within or on the mast (derrick) of the drill rig.
- Pipe, drill rods, casing, augers, and similar drilling tools should be stacked in an orderly manner, and secured on racks or sills to prevent spreading, rolling, or sliding.
- Penetration or other driving hammers should be placed at a safe location on the ground or be secured to prevent movement when not in use.
- Work areas, platforms, walkways, scaffolding, and other access ways should be kept free of materials, debris, and obstructions, and substances such as ice, grease, or oil that could cause a surface to become slick or otherwise hazardous.

- Keep all hand controls, control linkages, warning, and operation lights, and lenses free of excess oil, grease, ice, or other foreign material.
- Do not store gasoline in any portable container other than an OSHA-approved, nonsparking, red container with a flame arrester in the fill spout, and a proper placard as to contents.
- All gasoline engines, when operated in fire danger areas, will be equipped with exhaust spark arresters.

4. Maintenance Safety

- Shut down the drill rig engine to make repairs or adjustments to a drill rig or to lubricate fittings (except repairs or adjustments that can only be made with the engine running). Take precautions to prevent accidental starting of an engine during maintenance by removing or tagging the ignition key or ignition control.
- Always block the wheels, lower the leveling jacks, and set hand brakes before working under a drill rig.
- When possible, and appropriate, release all pressure on the hydraulic systems, the drilling fluid system, and the air pressure systems of the drill rig prior to performing maintenance.
- Never weld or cut on or near a fuel tank.
- Do not use gasoline or other volatile or flammable liquids as a cleaning agent on or around a drill rig.
- Replace all caps, filler plugs, protective guards, or panels, and high pressure hose clamps, and chains or cables that have been removed for maintenance before returning the drill rig to service.
- All persons shall remain clear of rotating equipment.
- All pressure hose connections shall be secured with safety chains, or clamped to prevent whipping in the event of a break.
- Each crew member shall report promptly any worn, defective, or unsafe items which is observed.
- Pipelines, tanks, and other storage facilities (for fuel, oil, gas, mud, soap, etc.) shall be kept from leaking.

5. Safe Use of Hand Tools

- When a tool becomes damaged, either repair it before using it again or remove it from service.
- Keep all tools cleaned, and stored in an orderly manner when not in use.
- Never use pipe wrenches in place of a rod holding device.
- Replace hook, and heel jaws when they become visibly worn.
- When breaking tool joints on the ground or on a drilling platform, position your hands so that your fingers will not be injured between the wrench handle, and the ground or the platform should the wrench slip or the joint suddenly let go.

6. Clearing the Work Area

Prior to drilling, adequate site clearing, and leveling should be performed to accommodate the drill rig, and supplies, and provide a safe working area. Drilling should not be commenced when tree limbs, unstable ground or site obstructions cause unsafe tool handling conditions or potential fire hazards.

7. Start Up

- All drill rig personnel, and visitors should be instructed to stand clear of the drill rig immediately prior to, and during starting of an engine.
- Make sure all gear boxes are in neutral, all hoist levers are disengaged, all hydraulic levers are in the correct nonactuating positions, and the cathead rope is not on the cathead before starting a drill rig engine.

8. Safety During Drilling Operations

- Do not drive the drill rig from hole to hole with the mast (derrick) in the raised position.
- Before raising the mast (derrick), look up to check for overhead obstructions, clear all drill rig personnel (except operator) and visitors from the areas immediately to the rear, front, and sides of the mast, and use leveling jacks and/or solid cribbing to level and stabilize the rig.
- The operator of a drill rig should only operate a drill rig from the position of the controls. The operator shall remain at control station at all times when rig is in operation.
- Throwing or dropping of tools should not be permitted.
- If it is necessary to drill within an enclosed area, make certain that exhaust fumes are conducted out of the area.
- All unattended boreholes must be adequately covered or otherwise protected to prevent drill rig personnel, site visitors, or animals from stepping or falling into the hole. All open boreholes should be covered, protected, or backfilled adequately, and according to local or state regulations on completion of the drilling project.
- When using a ladder on a drill rig, face the ladder, and grasp either the side rails or the rungs with both hands while ascending or descending. Do not attempt to use one or both hands to carry a tool while on the ladder.
- When climbing to a derrick platform that is higher than 20 ft. (6 m), a safety climbing device shall be used. Anyone working on a derrick board or platform shall wear a safety belt or harness securely fasten by a safety lanyard.
- When working on a derrick platform, do not guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or a traveling block. Only rack one pipe stand at a time.
- Loose tools, and similar items should not be left on the derrick platform or on structural members of the derricks.

- A derrick platform over 4 ft. (1.2 m) above ground surface should have toe boards, and safety railing that are in good condition.
- Before manually lifting any object, make sure that the load is within your personal lifting capacity.
- Personnel shall not ride the hoisting line, catline, traveling block, the traveling block hook, the elevators, or any equipment suspended therefrom as a means of ascending or descending to or from the derrick.
- Assure that equipment furnished for use on this site is maintained in safe operating condition, and operated by qualified operators. Cranes, pressure vessels, and large earth moving equipment shall have valid certificates, and logs of inspection, and maintenance.
- Assurance that the location of the nearest phone or radio to contact emergency services shall be prominently posted, and that emergency preparedness actions are recognized, and communicated to personnel.
- Safety meetings shall be held to inform employees, and other Subcontractors of progress of work, changes, hazards anticipated, and inspection deficiencies or good examples of employee protection. A daily toolbox meeting assures that good communications are maintained. A record must be kept of the subject, attendance at the meeting, and suggestions made.
- Horseplay, practical jokes, and scuffling are forbidden at all times on, and around the drill rig.

9. Overhead, and Buried Utilities

- Overhead, and buried utilities shall be located, noted, and emphasized on all boring location plans, and boring assignment sheets.
- When overhead electrical power lines exist at or near a drilling site or project, consider all wires to be alive, and dangerous.
- Watch for sagging power lines before entering a site. Do not lift power lines to gain entrance. Call the utility, and ask them to lift or raise the lines or de-energize (turn off) the power.
- An observer shall be posted at sufficient distance from the rig to adequately monitor for safe clearance during the raising, and lowering of the rig mast when operating in the vicinity of overhead powerlines or other overhead obstructions.
- Before raising the drill rig mast (derrick) on a site in the vicinity of power lines, walk completely around the drill rig. Determine what the minimum distance from any point on the drill rig to the nearest power line will be when the mast is raised, and/or being raised. Do not raise the mast or operate the drill rig if this distance is less than 20 ft. (6 m). SEC Donohue, Inc., policy for operating boomed or drilling equipment with mast, tower or derrick in proximity of overhead powerlines requires that a minimum clearance of 20 ft., plus the length of the boom or rig mast as measured in the horizontal plane, be maintained from any power line. The SEC Donohue, Inc., 20-ft. minimum clearance requirement to the OSHA requirement with approval of the SEC Donohue, Inc., grantor or designee. Any such approval will be granted only after a thorough inspection, which must determined that no safety hazard will be created or will exist by the application of

the OSHA requirement. Any such variance will be fully documented by the grantor. In addition, a Safe Work Permit must be issued before any work is performed under the variance.

- The mast shall not be raised or lowered during high wind conditions or when visibility is restricted. Hydraulic systems shall be checked prior to lowering the mast.

10. Safe Use of Electricity

- All wiring should be installed using high quality connections, fixtures, and wire, insulated, and protected with consideration of the drilling environment. Makeshift wiring, and equipment should not be permitted.
- All lights positioned directly above working areas should be enclosed in cages or similar enclosures to prevent loose or detached lamps or vapor-tight enclosures from falling on workers.
- Electrical cables should be guarded, and located to prevent damage by drilling operations or by the movement of personnel, tools, or supplies.
- All plug receptacles should be the 3-prong, U-blade, grounded type, and have adequate current carrying capacity for the electrical tools that may be used.
- All electric tools should have 3-prong, U-blade, groundwire plugs, and cords.
- Do not use electrical tools with lock-on devices.
- All electrical welders, generators, control panels, and similar devices should be adequately grounded.
- Control panels, fuse boxes, transformers, and similar equipment shall have a secure, protective enclosure. Only weather-proof boxes, and fittings shall be used for exterior application.
- Poles used to hold wiring, and lights shall not be used for any other purpose.
- Power shall be turned off before changing fuses or light bulbs.
- Only qualified electricians will work on electrical devices or on electric lines. Do not go near them.
- All portable electrical equipment used by personnel shall have GFCI protection.

11. Safe Use of Wire Line Hoists, Wire Rope, and Hoisting Hardware

- All wire ropes, and fittings should be visually inspected during use, and thoroughly inspected at least once a week for: abrasion, broken wires, wear, reduction in rope diameter, reduction in wire diameter, fatigue, corrosion, damage from heat, improper reeving, jamming, crushing, bird caging, kinking, core protrusion, and damage to lifting hardware.
- All manufactured end fittings, and connections shall be installed according to the manufacturer's instructions, and loaded according to the manufacturer's specifications. This would include cable clamps, and thimbles.
- If a ball-bearing type hoisting plug is used to hoist drill rods, the bearings shall be inspected, and lubricated daily to assure that the hoisting plug rotates freely under load.

- Wire ropes must be properly matched with each sheave. Non-rotating wire rope is suggested for light rig application.
- Minimize shock loading of a wire rope. Apply loads smoothly, and steadily.
- Avoid sudden loading in cold weather.
- Never use frozen ropes.
- Protect wire rope from sharp corners or edges. Avoid pile-up or uneven spooling of wire rope.
- Replace faulty guides, and rollers.
- Replace worn sheaves or worn sheave bearings.
- Replace damaged safety latches on safety hooks before using.
- Know the safe working load of the equipment tackle being used. Never exceed this limit.
- Know and do not exceed the rated capacity of hooks, rings, links, swivels, shackles, and other lifting aids.
- Do not guide wire rope on hoist drums with your hands.
- Following the installation of new wire rope, first lift a light load to allow the wire rope to adjust.
- Never leave a load suspended in the air when the hoist is unattended.
- Keep your hands away from hoists, wire rope, hoisting hooks, sheaves, and pinch points as slack is being taken up, and when the load is being hoisted.
- Never hoist the load over the head, body, or feet of any personnel.
- Never use a hoist line to "ride" up the mast (derrick) of a drill rig.

12. Safe Use of Cathead, and Rope Hoists

- Keep the cathead clean, and free of rust, and oil, and/or grease.
- Check the cathead periodically when the engine is not running for rope wear grooves.
- Never wrap the rope from the cathead (or any other rope, wire rope, or cable on the drill rig) around a hand, wrist, arm, foot, ankle, leg, or any other part of your body.
- Do not use a longer rope than necessary. A rope that is too long can form a ground loop or otherwise become entangled with the operator's legs.
- Do not use more rope wraps than are required to hoist a load, and that can be safely released.
- Do not leave a cathead unattended with the rope wrapped on the drum. Position all other hoist lines to prevent contact with the operating cathead rope.
- The cathead operator must be able to operate the cathead standing on a level surface with good, firm footing conditions without distraction or disturbance.

13. Safe Use of Augers

The following general procedures should be used when starting a boring with continuous flight or hollow-stem augers:

- Prepare to start an auger boring with the drill rig level, the clutch or hydraulic rotation control disengaged, the transmission in low gear, and the engine running at low RPM.

- Apply an adequate amount of down pressure prior to rotation to seat the auger head below the ground surface.
- Look at the auger head while slowly engaging the clutch or rotation control, and starting rotation. Stay clear of the auger.
- Slowly rotate the auger, and auger head while continuing to apply down pressure. Keep one hand on the clutch or the rotation control at all times until the auger has penetrated about one ft. or more below ground surface.
- If the auger head slides out of alignment, disengage the clutch or hydraulic rotation control, and repeat the hole starting process.
- An auger guide can facilitate the starting of a straight hole through hard ground or pavement.
- Only use the manufacturer's recommended method of securing the auger to the power coupling. Do not touch the coupling or the auger with your hands, a wrench, or any other tools during rotation.
- Whenever possible, use tool hoists to handle auger sections.
- Never place hands or fingers under the bottom of an auger section when hoisting the auger over the top of the auger section in the ground or other hard surfaces such as the drill rig platform.
- Never allow feet to get under the auger section that is being hoisted.
- When rotating augers, stay clear of the rotating auger, and other rotating components of the drill rig. Never reach behind or around a rotating auger for any reason whatever. A minimum of 18 inches clearance shall be maintained between personnel, clothing, footwear, and other personal protrudences, and the rotating augers, kellys, heads, drillrod, or other rotating components of the drill rig.
- Use a long-handled shovel to move auger cuttings away from the auger. Never use your hands or feet to move cuttings away from the auger.
- Do not attempt to remove earth from rotating augers. Augers should be cleaned only when the drill rig is in neutral, and the augers are stopped from rotating.
- Auger speed shall be that speed necessary for penetration, and cuttings removal. High speed auger rotation shall not be used for penetration or cuttings removal unless approved by the on-site SEC Donohue, Inc., supervisor. In such cases, all unnecessary personnel shall be removed from the rig operating area.

14. Safety During Rotary, and Core Drilling

- Water swivels, and hoisting plugs should be lubricated, and checked for "frozen" bearings before use.
- Pressure relief valves will be installed, and operable on all circulation systems.
- Drill rod chuck jaws should be checked periodically, and replaced when necessary.
- Drill rods should not be braked during lowering into the hole with drill rod chuck jaws.
- Drill rods should not be held or lowered into the hole with pipe wrenches.
- In the event of a plugged bit or other circulation blockage, the high pressure in the piping, and hose between the pump, and the obstruction should be relieved or bled down before breaking the first tool joint.

- When drill rods are hoisted from the hole, they should be cleaned for safe handling with a rubber or other suitable rod wiper. Do not use hands to clean drilling fluids from drill rods.
- If work must progress over a portable drilling guide (mud) pit, do not attempt to stand on narrow sides or cross members. The mud pit should be equipped with rough-surfaced, fitted- cover panels of adequate strength to hold drill rig personnel.
- Drill rods should not be lifted, and leaned unsecured against the mast. Provide some method of securing the upper ends of the drill rod sections for safe vertical storage or lay the rods down.

15. Off-Road Movement

General:

- Before moving a drill rig, walk the route of travel to inspect for depressions, stumps, gullies, ruts, and similar obstacles.
- Always check the brakes of a drill rig carrier before traveling, particularly on rough, uneven, or hilly ground.
- Check the complete drive train of a carrier at least weekly for loose or damaged bolts, nuts, studs, shafts, and mountings.
- Use caution when traveling side-hill. Conservatively evaluate sidehill capability of drill rigs, because the arbitrary addition of drilling tools which may raise the center of mass. When possible, travel directly uphill or downhill. Increase tire pressures before traveling in hilly terrain (do not exceed rated tire pressure).

16. Hazardous Materials, and Waste

- The Subcontractor shall assure MSDSs are provided for all hazardous materials, and personnel are trained in accordance with 29 CFR 1910.1200.
- Chemicals, corrosives, etc., shall be properly labeled, placarded, and stored.

17. Subcontractor Statement of Understanding

The Subcontractor, and each Subcontractor employee working on this project is required to read, and fully understand the provisions of this Plan. The Subcontractor, and each Subcontractor employee working on this project shall sign the attached STATEMENT OF UNDERSTANDING before commencing any work on this project.

SEC DONOHUE, INC.,
DRILLING SAFETY, and HEALTH PLAN
STATEMENT OF UNDERSTANDING

I, the undersigned, am an employee of the Subcontractor, doing business as _____,
have received, and have read the SEC Donohue, Inc., Drilling Health, and Safety Plan.
Further, I understand all provisions of the Plan.

	Name (please print)	Signature	Date	Position
1.	_____	_____	_____	_____
2.	_____	_____	_____	_____
3.	_____	_____	_____	_____
4.	_____	_____	_____	_____
5.	_____	_____	_____	_____
6.	_____	_____	_____	_____
7.	_____	_____	_____	_____
8.	_____	_____	_____	_____
9.	_____	_____	_____	_____
10.	_____	_____	_____	_____

TRAINING PROGRAM

All safety hazards at the site will be communicated, and individuals will receive instructions on the requirements of the Health, and Safety Plan. Training will include familiarity with MSDSs, which will be available for each contaminant. This training will be designed to address the requirements of OSHA Hazard Communication Standard (29 CFR 1910.1200), and the OSHA Hazard Waste Operations, and Emergency Response Standard (29 CFR 1910.120).

All employees, and contractors who work on site shall have successfully completed a training program that will include:

- Basic Safety Training - Stresses fundamentals such as the cause, and prevention of slip, trip, and fall hazards; safe lifting techniques; heat stress illnesses, and their prevention.
- Hazard Protection - This training deals with the identification, recognition, and safe work procedures for hazardous materials. The use, and limitations of applicable protective clothing, and decontamination procedures are an important part of this training.
- First Aid, and Cardiopulmonary Resuscitation (CPR) - At least half of the employees will have completed the standard Red Cross First Aid, and CPR courses. A minimum of at least 2 certified employees will be on site at all times.
- Health Hazard Awareness - Information will be available concerning on site hazardous materials to which employees may be exposed. The information will include routes of exposure, toxic effects, appropriate protective equipment, medical surveillance, and the specific nature of jobs which could result in exposure to chemicals.
- Work Practices - Engineering controls and safe work practices will be used to minimize risk.
- Hearing Conservation - Precautions will be taken to minimize the risk of potential hearing damage.
- Respirator Training - The use, limitations, and inspection of air purifying respirators, and self-contained breathing apparatus (SCBAs) will be covered. Respirator fit tests will be given to all personnel. These tests will consist of a qualitative fit using irritant smoke in a plastic containment structure.

All employees will have received a minimum of 40 hours of initial off-site instruction. On-site supervisors shall have completed at least 8 additional hours of specialized training on managing hazardous waste operations. This training includes familiarization with Safety, and Emergency Procedures. Each employee will also have received 3 days of on-the-job training.

TAILGATE SAFETY MEETINGS

Daily tailgate safety meetings will be conducted at the beginning of each shift or whenever new employees or contractors arrive at the job site once the job begins. At these meetings, health, and safety considerations, and the necessary protective equipment for the day's

activities will be discussed. This meeting will be conducted by the Project Manager or designee, and documented on an appropriate form. Each employee present will sign the form. Questions raised at these meetings will also be documented.

MATERIAL SAFETY DATA SHEETS

Complete MSDSs will be available in the work area for those materials known to be present. Additional MSDSs may be required in the event of discovery of additional materials on site. This information will be presented at the next tailgate meeting. MSDSs will be provided for materials brought on site for use during field work.

All training conducted on site will be documented on the appropriate form and retained by the Subcontractor in the employee's job file. The formal documentation of training will be maintained by SEC Donohue, Inc.

APPENDIX G
CALIBRATION PROCEDURES

Chem-Nuclear Environmental Services	Procedure No. IH-001	Revision No. 0	Page 1 of 18
Procedure Title: Operation of the hNu Photoionization Analyzer			

Author: S. L. Liskade Date: 11-13-91

Independent Reviewer: Robert D. Sanders Date: 11-13-91

Program Manager: H. Williams Date: 11-13-91

Effective Date: 11-13-91

Chem-Nuclear Environmental Services	Procedure No. IH-001	Revision No. 0	Page 2 of 18
Procedure Title: Operation of the hNu Photoionization Analyzer			

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Chem-Nuclear Environmental Services	Procedure No. IH-001	Revision No. 0	Page 3 of 18
Procedure Title: Operation of the hNu Photoionization Analyzer			

1.0 PURPOSE

This procedure defines the methodology for operation, calibration, and maintenance of the hNu ISPI 101 photoionization analyzer.

2.0 DISCUSSION OF SIGNIFICANCE AND USE

- 2.1 The hNu ISPI 101 is a portable photoionization analyzer used to detect, measure, and provide a direct readout of the concentration of a variety of gases.
- 2.2 Three sensors are available for use with the analyzer: 9.5 eV, 10.2 eV and 11.7 eV. Each sensor has a sealed ultraviolet light source. The light source emits photons of a high enough energy to ionize many trace gases. However, the photon energy is not high enough to ionize the components of air. This process is illustrated by the following:



Where:

RH = trace gas

$h\nu$ = photon with an energy > ionization potential of RH

- 2.3 The unit has a readout assembly, interchangeable probes, and a battery charger. Each probe contains the sensor, fan, and amplifying circuits. The readout assembly has controls, power supply (1000 VDC), rechargeable battery, and a three range analog meter (0-20, 0-200, and 0-2000 ppm).
- 2.4 To minimize the absorption and decomposition of the samples gas(es), a flow of 100 cc/min. is maintained through the ion chamber that is small, inert, and located at the sample point. The fan draws the sample through the probe inlet, into the ion chamber, and out the exhaust port in the handle of the probe.
- 2.5 To ensure accurate readings, the ISPI 101 is designed to operate at battery voltages > 11 VDC. A low battery will cause the analyzer to shut off automatically.
- 2.6 The unit cannot be operated when the battery charger is correctly connected.

Chem-Nuclear Environmental Services	Procedure No. IH-001	Revision No. 0	Page 4 of 18
Procedure Title: Operation of the hNu Photoionization Analyzer			

3.0 RESPONSIBILITY

3.1 The Health and Safety Manager is responsible for implementation of this procedure.

3.2 CNES personnel operating the hNu ISPI 101 shall follow the guidelines of this procedure. Problems encountered with the use of this procedure shall be expediently reported to the Health and Safety Manager or his designee.

4.0 HAZARD ANALYSIS AND CONTROLS

4.1 DO NOT observe the light source from closer than six inches as damage to the eye can occur. If the light source must be observed, do so briefly.

4.2 The fan cannot draw a sample across a pressure drop. Every effort shall be made to keep dirt, dust, water, and other debris from entering the probe. NEVER attempt to filter samples using glass wool or other materials. If water is aspirated, clean unit as described in paragraph 3.1.5.

4.3 The ISPI 101 is a non-destructive analyzer. Calibrations requiring the use of toxic gases shall be done as prescribed by the Health and Safety Manager.

4.4 Measurements in excess of the Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PELs) or the American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values (TLVs) or an action level prescribed by the Health and Safety Manager shall be immediate cause to take protective actions.

4.5 The battery shall not be recharged in hazardous atmospheres, e.g., > 25% O₂ or LEL.

4.6 Extreme care shall be taken when handling calibration gas cylinders. The contents are under pressure. The Material Safety Data Sheet (MSDS) should be consulted prior to use.

4.7 Prior to disassembly of the probe, turn the function switch to off and disconnect the probe from the readout assembly. Otherwise, a 1000 VDC voltage will be present in the probe assembly.

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- 4.8 The ISPI 101 is suitable for use in Class I, A, B, C, D atmospheres as defined in Article 500 of the National Electric Code. The only exception is when charging.
- 4.9 The readout assembly shall not be disassembled without prior approval from Health and Safety Manager.
- 4.10 Lamps shall only be cleaned with approved compounds. Do not use hNu cleaning compound or a like substance on the 11.7 eV lamp.
- 4.11 The ISPI 101 should not be used in temperatures $< -10^{\circ}\text{C}$ (14°F) or $> 40^{\circ}\text{C}$ (104°F).
- 4.12 Calibrations should be performed in the ambient temperature, pressure, and humidity conditions of the sample area up wind of potential sources, and out of strong gusty winds.
- 4.13 Avoid sampling in rainy conditions.

5.0 PRE-JOB PLANNING

- 5.1 Ensure an adequate supply of calibration gas is available. MSDSs shall also be available in accordance with local, state, federal, and CNES regulations.
- 5.2 A 200-250 cc/min. regulator or a tee connector set-up (for unregulated gas valves) shall be used to prevent over pressure of the probe assembly.
- 5.3 The hNu calibration gas humidifier is strongly recommended for use in calibration.
- 5.4 Ensure that all precautions are in place prior to performing calibrations with toxic gases or obtaining measurements in hazardous atmospheres.
- 5.5 The following tools and equipment may be required during disassembly and/or cleaning:

5/32" Hex End Wrench
 Medium Phillips Screwdriver
 Small Flat Head Screwdriver
 Lint Free Cloth/Tissue
 Freon Base Supply
 O-Ring Kit
 hNu Cleaning Compound

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5.6 Calibrations should normally be performed at 50-80% of the 200 ppm scale. This will provide accurate readings on the 20 ppm scale as well. Pre-calibration checks on the 2000 ppm range are required only when the range is expected to be used. Post-calibration check of the 2000 ppm range is required when the range was used without a pre-calibration. The 2000 ppm range should be calibrated between 150-210 ppm or 450 to 500 ppm as necessary.

6.0 INSTRUCTIONS

6.1 Unpacking/Assembly

- 6.1.1 Unclamp the cover from the readout assembly and remove.
- 6.1.2 Remove the inner lid from the cover by pulling out the two fasteners. This provides access to the carrying straps, probe extension, charger, and adaptor.
- 6.1.3 Select the probe with the correct eV lamp for the atmosphere to be sampled. Connect the probe extension to the probe. Ensure O-Ring is in place.
- 6.1.4 Connect the probe cable plug to the 12 pin keyed socket on the readout assembly. Carefully match the alignment slot in the plug to the keyway in the connector. Screw down the connector until a distinct snap and lock is felt.

NOTE

Refer to Appendix 9.1 for locations of controls and indicators.

6.2 Operation

6.2.1 Battery Check

- 6.2.1.1 Turn the function switch to the BATT position and check to see that the needle deflects to the green arc. If the meter is below the green zone or the low battery indicator lights, charge the unit as necessary. A full charge requires 12-14 hours and will last for 6 hours of continuous use with the 10.2 eV lamp (less with the 11 eV).

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- 6.2.1.2 Turn the function switch to any of the three meter ranges. Listen to the probe for fan operation and BRIEFLY GLANCE at the lamp (> 6 inches away) to observe a purple glow. If a malfunction is observed, attach a "defective" tag to the probe and notify the Health and Safety Manager.
- 6.2.1.3 Allow the unit to warm up for about 10 minutes prior to operation or calibration. Recheck the battery's outlined in Step 6.2.1.1.
- 6.2.1.4 Set the span at 9.8 for use with 10.2 eV lamps or 5.0 for use with 11.7 eV lamps.

NOTE

Zeroing may be accomplished using 6.2.2 or 6.2.3.

- 6.2.2 Electrically zeroing the meter.
 - 6.2.2.1 To electrically zero the meter turn the function switch to standby and rotate the zero knob to align the needle at zero.
- 6.2.3 Zeroing the meter with gas.
 - 6.2.3.1 Turn the function switch to the 0-20 ppm range.

NOTE

Do not use calibration gas humidifier during zeroing.

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6.2.3.2 Turn on the gas supply and connect it to the probe extension. See Appendix 9.2 or 9.3 for gas delivery methods.

6.2.3.3 Rotate the zero knob until the needle is at zero or within the gas manufacturers' specifications.

NOTE

Calibrations shall be performed at least daily or prior to use whichever is necessary.
Use either Step 6.2.4 or 6.2.5 as appropriate.

6.2.4 Calibration checks with isobutylene.

NOTE

See Step 5.6 to determine calibration ranges.

6.2.4.1 Multiply the manufacturer isobutylene concentration on the bottle by 70% (0.7) to obtain the corrected isobutylene concentration.

6.2.4.2 Turn the function switch to the range to be calibrated.

6.2.4.3 Select a gas delivery method. Refer to Appendix 9.2 or 9.3.

6.2.4.4 Turn on the gas supply and connect it to the probe extension. Adjust flow as necessary to maintain proper fan operation.

NOTE

Span readings < 4.8 (10.2 eV) or < 2.5 (11.7 eV)
may indicate the lamp needs cleaning.

6.2.4.5 Adjust the span potentiometer as necessary to obtain the reading corresponding to the corrected isobutylene concentration in the bottle.

6.2.4.6 Remove the gas supply and turn it off.

6.2.4.7 If other points/ranges are to be calibrated, return to Step 6.2.4.1 and repeat. If not, the instrument may be turned off until ready for use.

6.2.4.8 Readings obtained will be equivalent isobutylene.

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6.2.5 Calibration for other gas equivalencies.

NOTE

Photosensitivities of some common gases can be found in Appendix 9.4.

NOTE

Readings will be equivalent to the PS2 reference gas.
PS2 is generally 10 (photosensitivity benzene).

6.2.5.1 Calculate the correct instrument response using the following equation: $CC = CF \times CB$

Where:

CC = Corrected gas concentration (ppm)

CB = Bottle gas concentration (ppm)

CF = Correction factor = $\frac{PS1}{PS2}$

PS1 = Photosensitivity of calibration gas

PS2 = Photosensitivity of reference gas

6.2.5.2 Select a gas delivery method. Refer to Appendix 9.2 or 9.3.

CAUTION

Consult the Health and Safety Manger regarding precautions associated with toxic calibration gases.

6.2.5.3 Turn the function switch to the range to be calibrated.

6.2.5.4 Turn on the gas supply and connect it to the probe extension. Adjust the flow as necessary to maintain proper fan operation.

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NOTE

Span readings < 4.8 (10.2 eV) or < 2.5 (11.7 eV)
may be an indication the lamp needs cleaning.

- 6.2.5.5 Adjust span as necessary to obtain the correct response as calculated in Step 6.2.5.1, or adjust span to manufacturer's gas concentration and apply CF in the field. $CF \times \text{meter reading} =$ equivalent reference gas.
- 6.2.5.6 Remove the gas supply and turn it off.
- 6.2.5.7 If other points/ranges are to be calibrated, return to Step 6.2.5.1 and repeat. If not, the instrument may be turned off until ready for use.

6.3 Maintenance

NOTE

Refer to Appendix 9.5 for probe assembly illustration.

6.3.1 Lamp Removal

- 6.3.1.1 Remove the probe extension. Inspect the O-Ring for damage. Wipe clean or replace as necessary. If necessary flush the probe extension with soapy water to remove dirt and grime, rinse and allow to dry before replacing.

CAUTION

DO NOT twist the probe shell as this will
damage the internal electronics.

- 6.3.1.2 Remove the 5/32" hex screw (exhaust port). Place one hand on the probe shell and the other on the end cap. Very gently slide the innards out by pulling on the end cap. DO NOT TWIST!
- 6.3.1.3 Remove the two crosshead screws that hold the end cap on. Remove the end cap. Inspect the end cap And O-Ring on inside for damage. If necessary, replace O-Ring or clean end cap and O-Ring with soapy water, rinse, and wipe dry.

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NOTE

When exposed, extreme care shall be taken
to prevent damaging the lamp.

- 6.3.1.4 Remove the two screws holding the ion chamber. Gently pull the ion chamber away from the lamp lens. Inspect the ion chamber and O-Ring. Wipe the O-Ring clean or replace as necessary.
- 6.3.1.5 The ion chamber may be cleaned by agitating it in a beaker of methanol. Allow chamber to dry overnight or very carefully dry with a heat gun. Chamber may also be baked in an oven for two hours at 100°C. DO NOT exceed 100°C while drying. Allow chamber to cool to room temperature prior to reassembly.
- 6.3.1.6 Loosen the small set screw in the side of the lamp assembly. Place your hand over the lens and tilt. The lamp will fall into your hand.

NOTE

Steps 6.3.1.7, 6.3.1.8 and 6.3.1.9 apply to
10.2 eV lamps ONLY.

- 6.3.1.7 Place a small drop of hNu cleaning compound on the lens of the lamp. Using a tissue, rub in a circular motion until residue is removed.
- 6.3.1.8 Rinse with clean, hot tap water and thoroughly dry with a lint free cloth or tissue.
- 6.3.1.9 If lens is not clean, repeat Steps 6.3.1.7 and 6.1.3.8 as necessary.

NOTE

DO NOT USE hNu cleaning compound, water or any
water-miscible solvent on 11.7 eV lamps.

- 6.3.1.10 11.7 eV lamps can be cleaned by applying a small amount of a chlorinated solvent on the lens end of the lamp only. Wipe clean with a lint free tissue or cloth.
- 6.3.2 Reassembly

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NOTE

NEVER exchange lamps of a different eV rating between probes. Electronic components are installed for a specific eV rating. A wrong lamp will not operate properly and may damage the probe.

- 6.3.2.1 Hold the lamp assembly upright and gently insert the lamp (lens up). Tighten the lamp set screw.
- 6.3.2.2 Re-insert the O-Ring in the groove on the bottom of the ion chamber.
- 6.3.2.3 Place the ion chamber (wire mesh up) over the lens. Ensure the small hole in the ion chamber lines up with the vent hole in the probe, which has a small black O-Ring around it. Secure chamber with the two screws. Do not over tighten; this causes the ion chamber to bulge and makes it difficult to replace the end cap.
- 6.3.2.4 Replace the end cap, align screw holes, and secure with the two crosshead screws.
- 6.3.2.5 Ensure the shell ground screw is exactly perpendicular to the lamp assembly socket. If not, rotate the shell.

NOTE

If resistance is encountered while replacing the lamp assembly, remove it, determine the cause, and relieve it as required to prevent damage to the lamp assembly.

- 6.3.2.6 Gently slide the lamp assembly into the shell. Ensure correct alignment and seat firmly into socket.
- 6.3.2.7 Replace 5/32" hex screw.

7.0 RECORDS REVIEW AND DISPOSITION

- 7.1 Calibration data shall be recorded and retained as per current policies and procedure.

8.0 REFERENCES

- 1 hNu ISPI 101 Photoionization Analyzer Instruction Manual

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9.0 APPENDICES

9.1 Controls and Indicators

9.2 Tee Connector Calibration Set Up

9.3 250 cc/min. Regulated Flow Calibration Set Up

9.4 Photosensitivities for Some Common Industrial Chemicals

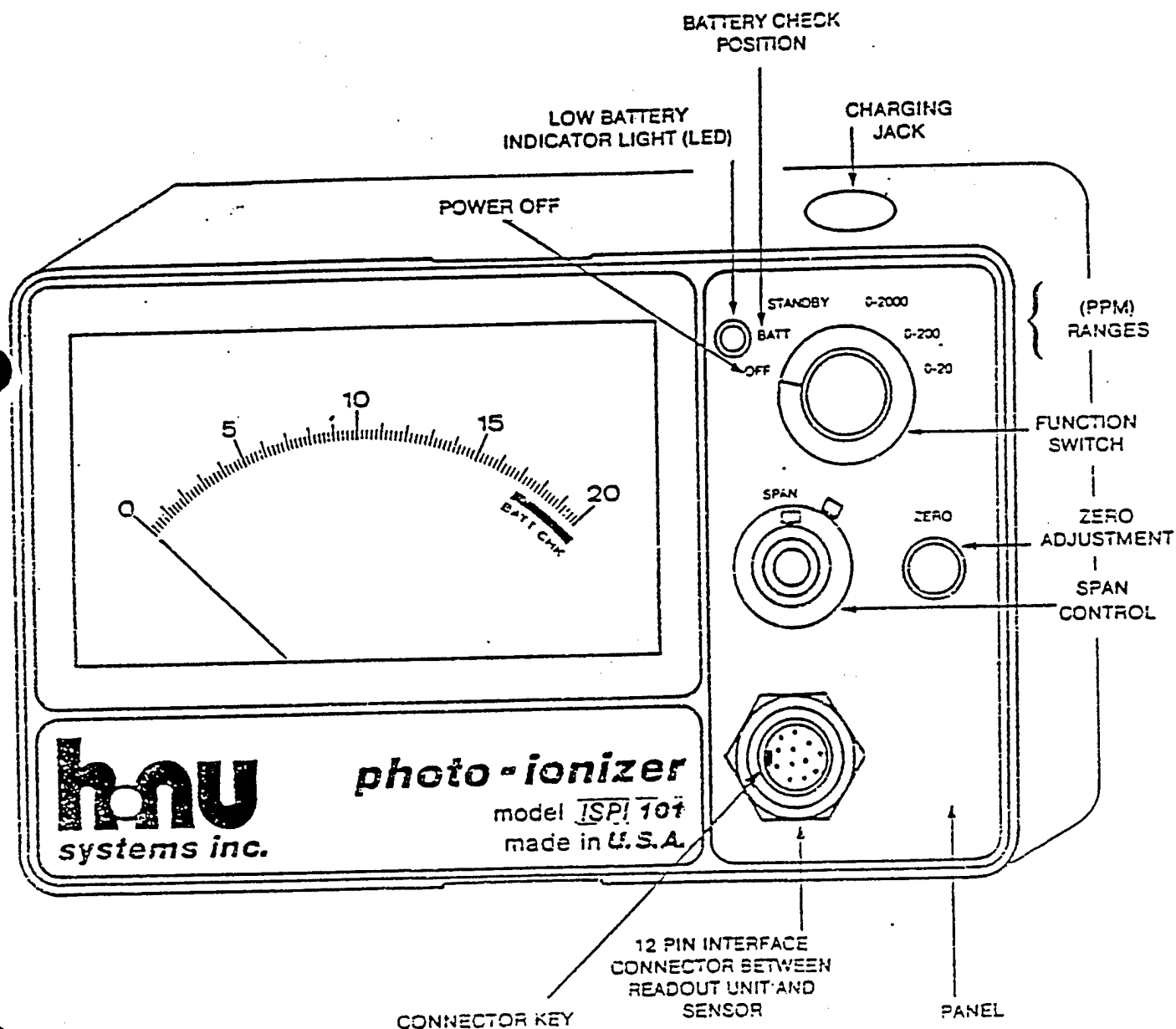
9.5 Probe Assembly

10.0 KEYWORDS

10.1 hNu, Photoionization Analyzer, ISPI 101

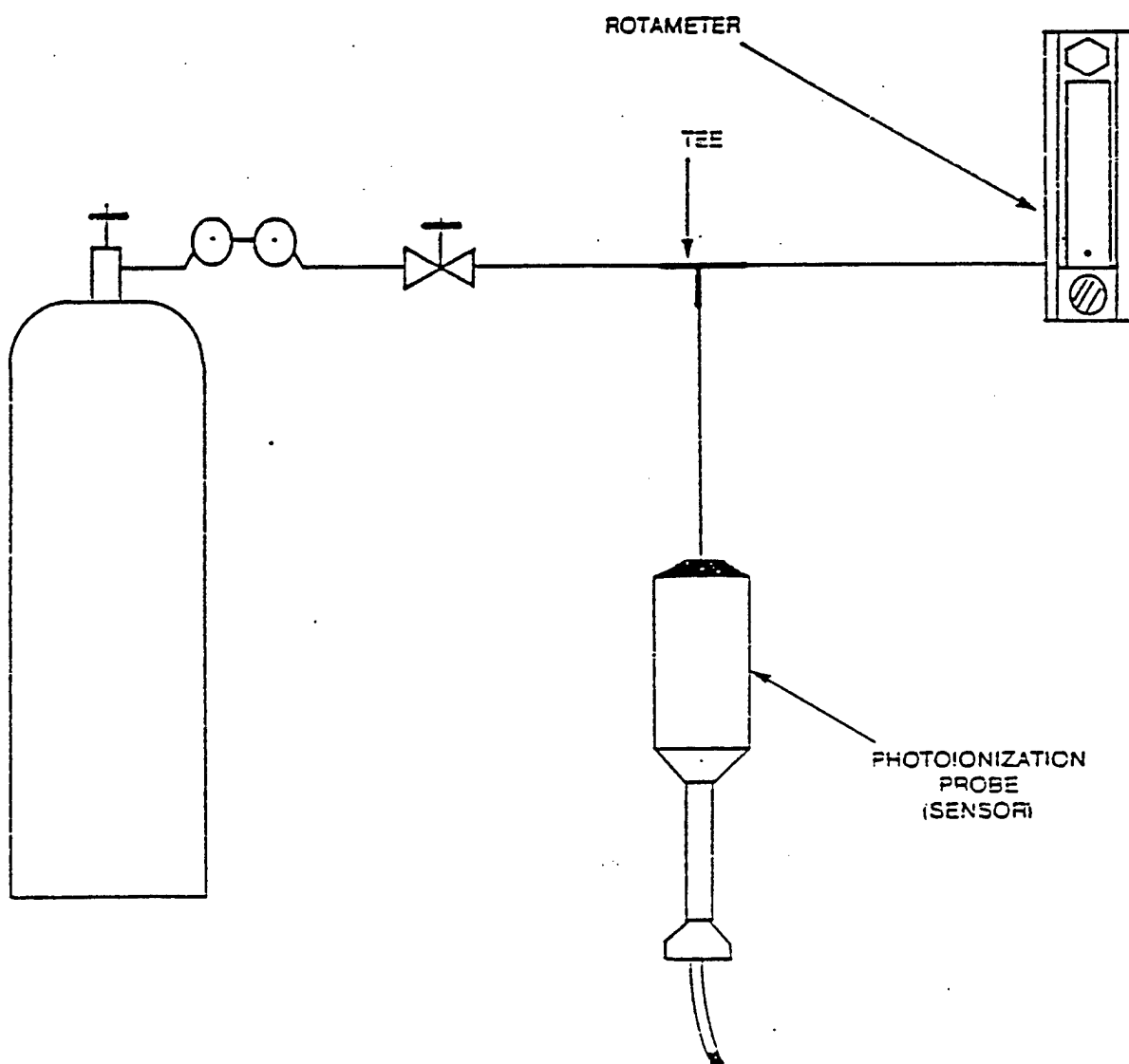
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9.1 Controls and Indicators



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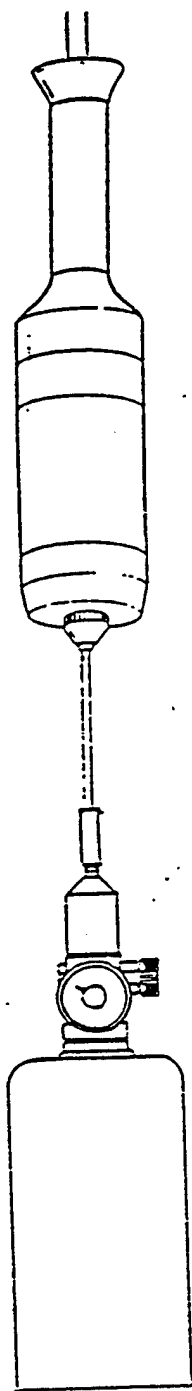
9.2 Tee Connector Calibration Set Up



Procedure Title:

Operation of the hNu Photoionization Analyzer

9.3 250 cc/min. Regulated Flow Calibration Set Up



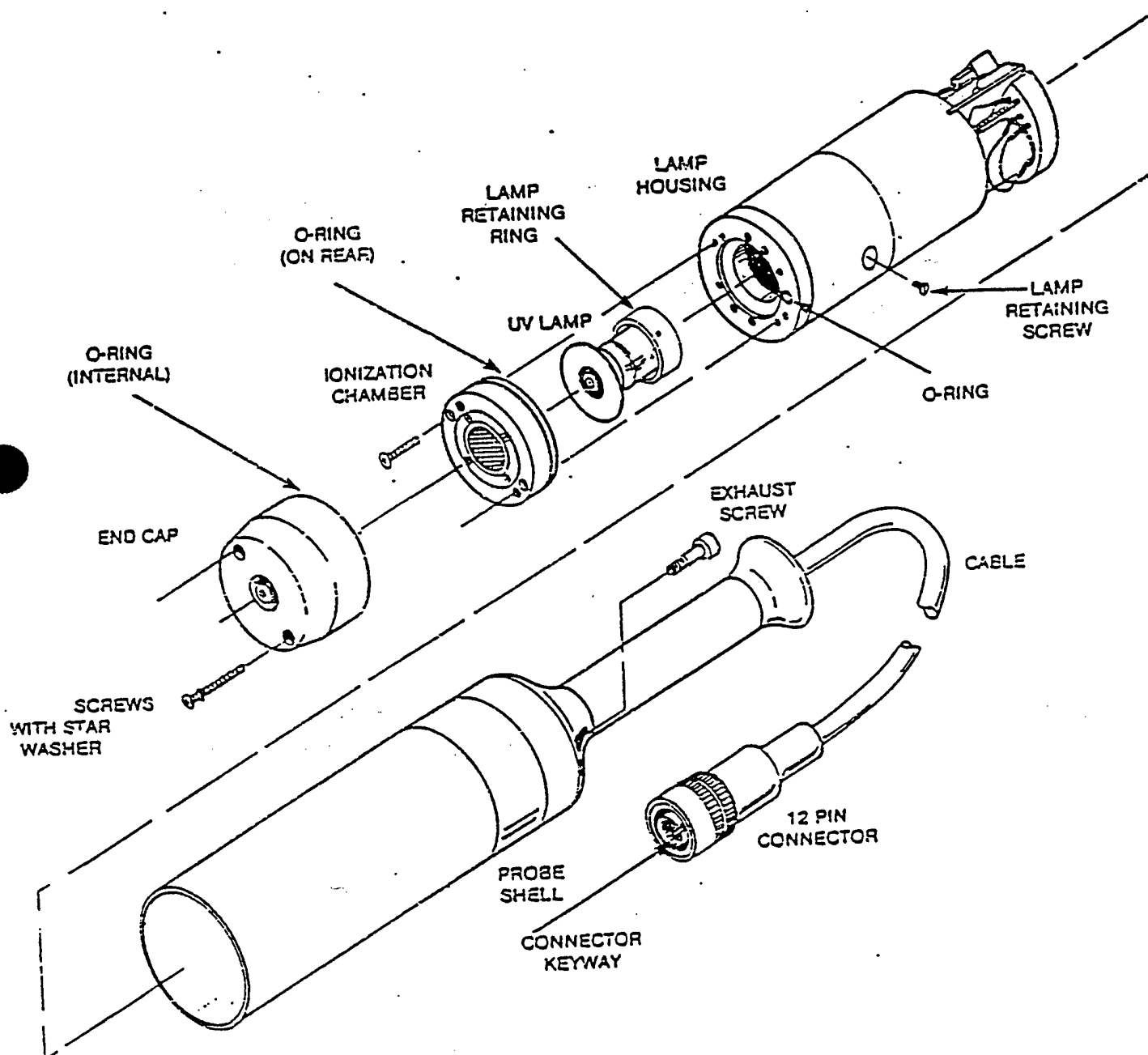
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9.4 Photosensitivities for Some Common Chemicals

GAS	PHOTOIONIZATION SENSITIVITY	GAS	PHOTOIONIZATION SENSITIVITY
p-xylene	11.4	ethylene	1.0
m-xylene	11.2	isopropanol	1.0
benzene	10.0	ethylene oxide	1.0
toluene	10.0	acetic anhydride	1.0
diethyl sulfide	10.0	alpha pinene	0.7
diethyl amine	9.9	dibromochloropropane	0.7
styrene	9.7	epichlorohydrin	0.7
trichloroethylene	8.9	nitric oxide	0.6
carbon disulfide	7.1	beta pinene	0.5
isobutylene	7.0	citral	0.5
acetone	6.3	ammonia	0.3
tetrahydrofuran	6.0	acetic acid	0.1
methyl ethyl ketone	5.7	nitrogen dioxide	0.02
methyl isobutyl ketone	5.7	methane	0.0
cyclohexanone	5.1	acetylene	0.0
naptha (86% aromatics)	5.0		
methyl isocyanate	4.5		
iodine	4.5		
methyl mercaptan	4.3		
dimethyl sulfide	4.3		
allyl alcohol	4.2		
propylene	4.0		
mineral spirits	4.0		
2, 3-dichloropropene	4.0		
cyclohexene	3.4		
crotonaldehyde	3.1		
crotoaldehyde	3.1		
acrolein	3.0		
methyl methacrylate	3.0		
pyridine	3.0		
hydrogen sulfide	2.8		
ethylene dibromide	2.7		
n-octane	2.5		
acetaldehyde oxime	2.3		
hexane	2.2		
phosphine	2.0		
heptane	1.7		
allyl chloride	1.5		
(3-chloropropene)			

Procedure Title:
Operation of the hNu Photoionization Analyzer

9.5 Probe Assembly



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Procedure Title: Colormetric Indicator Tubes and Pump - Draeger			

Author: Tom Richards Date: 11-1-91

Independent Reviewer: [Signature] Date: 11-1-91

Program Manager: [Signature] Date: 11-1-91

Effective Date: 11-1-91

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Procedure Title: Colormetric Indicator Tubes and Pump - Draeger			

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2.0 SIGNIFICANCE AND USE	3
2.1 Field Check	3
2.2 Operation	3
3.0 INTERPRETATION OF RESULTS	4

Chem-Nuclear Environmental Services	Procedure No. IH-002	Revision No. 0	Page 3 of 4
Procedure Title: Colormetric Indicator Tubes and Pump - Draeger			

1.0 PURPOSE

This procedure specifies the requirements and methods for using Draeger tubes and pump.

Draeger indicator tubes are used to indicate a specific chemical or group of chemicals. Tubes are available in different concentration ranges for some chemicals. While in storage they should be refrigerated. Tubes should not be used beyond their stamped expiration date.

2.0 SIGNIFICANCE AND USE

2.1 Field Check

All colormetric indicator tubes and pumps should be field checked prior to use. This field check tests for pump leaks in the following manner:

2.1.1 Insert an unopened tube into the pump's tube holder.

2.1.2 If using a bellows-type pump, squeeze the bellows. After 2 minutes, bellows should not regain its original shape or chain should not be taut. If a pump fails this test, it should be serviced according to the manufacturer's instructions.

2.2 Operation

The following steps are used for instrument operation:

2.2.1 Break off both tips of a fresh colormetric indicator tube in break-off eyelet on front cover plate or in tube breaker.

2.2.2 Insert tube into pump head with arrow on tube pointing towards pump.

2.2.3 Hold pump between thumb and the base of index finger with front cover plate contacting finger.

2.2.4 In atmosphere to be sampled, begin compressing pump bellows.

2.2.5 Compress the bellows completely with a squeezing motion assuring that the total volume of the bellows is used.

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Procedure Title: Colormetric Indicator Tubes and Pump - Draeger			

2.2.6 Release grip and allow chain to become taut, signifying that 100 cc's of air have been pulled through the tube. Be sure to keep the tube end in the atmosphere being sampled for the specified time.

2.2.7 Complete steps 4 and 5 as many times as the tube's instruction state.

2.2.8 Read concentration of material in air at stained/unstained interface.

3.0 INTERPRETATION OF RESULTS

3.1 If no discoloration occurs when the system is used according to the instructions accompanying the tubes, the sampling results are less than the lower detection limit listed for that type of tube.

3.2 If the color change occurs within the detection range of the tube when the instructions for that tube are followed, the concentration at the coloration/discoloration interface is expressed as _____ ppm \pm 25%.

3.3 Readings at or above the top of the detection range should be expressed as above that specific level.

3.4 The date, time, sampler name, tube type, number of pump strokes, and results will be reported in the logbook along with the pertinent identifier of the project.

3.5 A copy of the appropriate logbook will be filed in the project file.

SEC Donohue, Inc.	Procedure No. IH-003	Revision No. 0	Page 1 of 9
Procedure Title: Airborne Metals Sampling			

Author: Thomas L. Richards Date: 4-6-92

Independent
Reviewer: John Lullam Date: 4-6-92

Division Manager,
Mountain Region: Robert D. Sanders Date: 4-6-92

Effective Date: 4-10-92

SEC Donohue, Inc.	Procedure No. IH-003	Revision No. 0	Page 2 of 9
Procedure Title: Airborne Metals Sampling			

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6.3 Flow Parameters	5
6.4 Quality Assurance	5
6.5 Personnel Sampling Procedures	6
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7.0 RECORDS REVIEW AND DISPOSITION	6
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SEC Donohue, Inc.	Procedure No. IH-003	Revision No. 0	Page 3 of 9
Procedure Title: Airborne Metals Sampling			

1.0 PURPOSE

This procedure will present the airborne sampling method for metal bearing particulates. Metals covered by this method are:

Aluminum	Chromium	Magnesium	Selenium	Titanium
Arsenic	Cobalt	Manganese	Silver	Tungsten
Barium	Copper	Molybdenum	Sodium	Vanadium
Beryllium	Iron	Nickel	Tellurium	Yttrium
Cadmium	Lead	Phosphorus	Thallium	Zinc
Calcium	Lithium	Platinum	Tin	Zirconium

By sampling for airborne metal dusts and fumes, these workplace hazards will be known and proper worker protection can be provided.

2.0 SIGNIFICANCE AND USE

2.1 This sampling method follows NIOSH 7300 which uses Inductively Coupled Argon Plasma - Atomic Emission Spectroscopy. Most metals are included in this method. However, organoarsenic compounds, barium, hexavalent chromium, mercury, nickel carbonyl, organotin compounds, and vanadium oxides are not covered and most cannot be accurately analyzed by NIOSH 7300.

3.0 RESPONSIBILITY

3.1 Health and Safety Management will determine the applicability of this procedure to special sampling situations. Exceptions to use of this method will also be decided by Health and Safety Management.

3.2 Health and Safety personnel are responsible for sampling of airborne metals using this procedure.

4.0 HAZARD ANALYSIS

4.1 This procedure does not present a hazard to personnel conducting the sampling.

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Procedure Title: Airborne Metals Sampling			

5.1 PRE-JOB PLANNING

5.1 Prerequisites

- 5.1.1 Ensure an adequate supply of 0.8 micron mixed cellulose ester filters in three-piece cassettes for the entire job. Discern whether the activity will allow enough time to collect a sample that has a reasonable detection limit.

5.2 Requirements

5.2.1 Equipment

- 0.8 micron pore, mixed cellulose ester (MCE) filter-37mm dia.
- Support pad
- 37mm diameter clear "plastic" three-piece cassette
- Personal sampling pump, high flow, low volume
- Hose barbs
- Flexible tubing of appropriate diameter and length
- Lapel Clip
- Belt or other attachment for pump
- Shrink or electrical tape

6.0 INSTRUCTIONS

6.1 Sampling Train

- 6.1.1 If the cassette is not preloaded, place support pad against radiating ribs on base of opened cassette (may be indicated as outlet on cassette); then place the MCE filter on the support pad and close the cassette (sampling will be closed face). Also, wrap shrink tape or electrical tape around the gap between the two cassette halves to prevent leakage (Figure 1).
- 6.1.2 Attach a hose barb to the cassette side with the radiating ribs and connect the flexible tubing to the hose barb.
- 6.1.3 Attach the other side of the flexible tubing to the pump.

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Procedure Title: Airborne Metals Sampling			

CAUTION

All potential air leak locations should be checked to ensure that the entire amount of air calibrated as flowing through the filter is not leaking elsewhere.

6.2 Calibration

- 6.2.1 Fit a hose barb to the inlet side of the cassette and attach to the tubing connected to the calibrator.

6.3 Flow Parameters

- 6.3.1 Keep the flow rate between 1 and 4 liters per minute (LPM). Flow rates will depend on environmental condition and time constraints. If soil conditions are dusty, reduce flow rate; if conditions are damp and minimal airborne disturbance will occur, an increased flow rate is recommended.
- 6.3.2 Sample volumes generally should be kept between 250 and 2000 liters but specific questions of total volume should be referred to Figure 2. The target volume in most cases will be between 1000 and 2000 liters.
- 6.3.3 Samples should be collected for the longest period allowed by the dust conditions, total volume limits, task length, etc. to be the most representative of worker exposure.

6.4 Quality Assurance

- 6.4.1 Prepare the field blanks at about the same time when sampling has began. The field blanks will consist of unused filters and cassettes from the same lot used for sample collection. Remove the caps on the cassettes in a clean area approximately when sampling begins but do not draw air through them. Replace the caps after sampling is finished. Label and submit as blind blanks. Two field blanks are required for each 10 samples up to a maximum of 10 field blanks per sample set. Two field blanks are the minimum submitted. The average of the field blanks may be subtracted from the sample results.

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6.5 Personnel Sampling Procedure

6.5.1 Attach the sample pump securely to the belt in a position most comfortable for the worker, usually behind the hip. Run the flexible tubing over the shoulder so that it does not hinder worker movement and attach the clip near the filter to the lapel or collar (Figure 1). The filter cassette must be placed within two feet of the workers nose to be in the breathing zone and should be placed as close as practical to the nose. The filter opening will not be obstructed or oriented upward (to prevent particulates that would not ordinarily be collected from settling on the filter). The ideal filter orientation would be with the two filter openings in the same horizontal plane but a downward orientation of the opening is acceptable and more practical.

6.5.2 Record the pertinent information.

6.5.3 Remove the plug just before starting the sample pump. Note the time the pump is turned on and ensure that the sampling train is functioning properly.

6.5.4 Once sampling is completed, turn the pump off, replace the plug in the inlet, and record the time and any changes in weather conditions. Remove the pump from the worker.

6.5.5 Post-calibrate the pump.

6.6 Area Sampling Procedures

6.6.1 Place the pump on a stationary support or surface and suspend the cassette about 5 feet above the ground or elsewhere as appropriate for the sample desired. Follow 6.5.2 through 6.5.5 as described above.

7.0 RECORDS REVIEW AND DISPOSITION

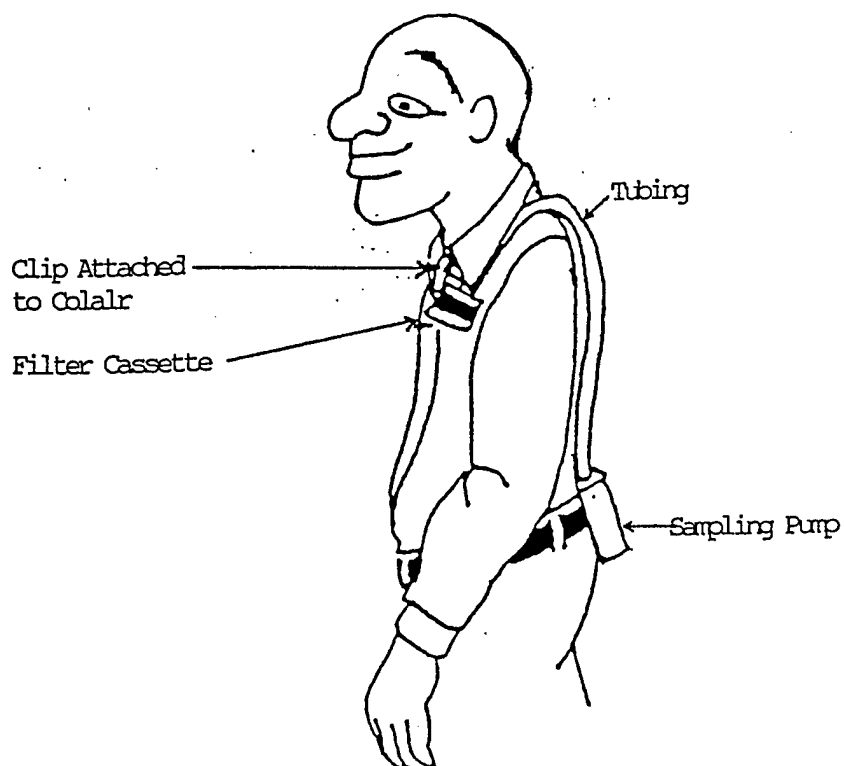
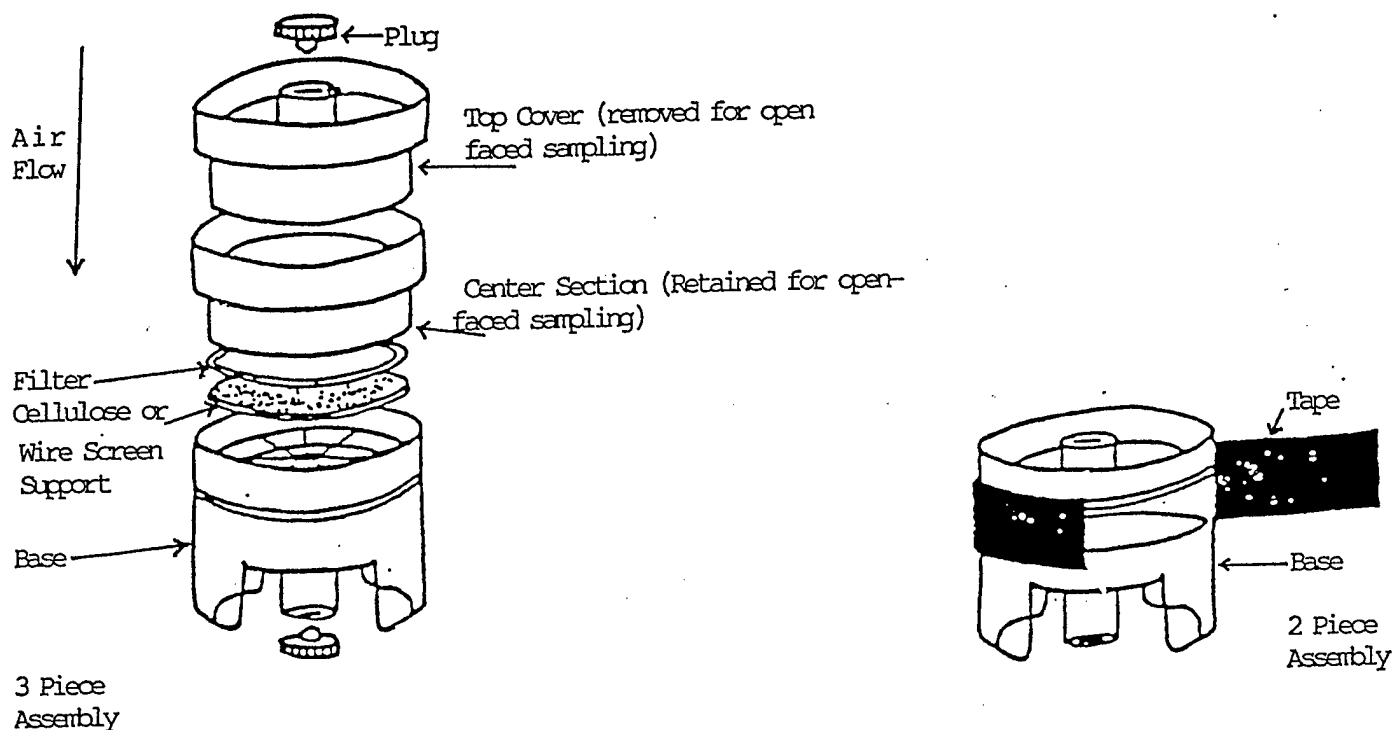
7.1 No new records or forms are generated by this procedure.

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Procedure Title: Airborne Metals Sampling			

8.0 REFERENCES

- 8.1 NIOSH Manual of Analytical Methods (Third Edition) 1987
- 8.2 Air Sampling Instruments for Evaluation of Atmospheric Contaminants, 7th Edition, American Conference of Governmental Industrial Hygienists, 1989
- 8.3 1990 SKC Comprehensive Catalog and Guide
- 8.4 Hager Laboratories Air Sampling Manual

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Procedure Title: Airborne Metals Sampling			Figure 1



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Procedure Title: Airborne Metals Sampling			Figure 2

<u>ELEMENT (SYMBOLS)</u>	<u>ATOMIC WEIGHT</u>	<u>AIR VOLUME FROM OSHA, L</u>	
		<u>MINIMUM</u>	<u>MAXIMUM</u>
Silver (Ag)	107.87	250	2000
Aluminum (Al)	26.98	5	100
Arsenic (As)	74.92	5	2000
Beryllium (Be)	9.01	1250	2000
Calcium (Ca)	40.08	5	200
Cadmium (Cd)	112.40	13	2000
Cobalt (Co)	58.93	25	2000
Chromium (Cr)	52.00	5	1000
Copper (Cu)	63.54	5	1000
Iron (Fe)	55.85	5	100
Lithium (Li)	6.94	100	2000
Magnesium (Mg)	24.31	5	67
Manganese (Mn)	54.94	5	200
Molybdenum (Mo)	95.94	5	67
Sodium (Na)	22.99	13	2000
Nickel (Ni)	58.71	5	1000
Phosphorus (P)	30.97	25	2000
Lead (Pb)	207.19	50	2000
Platinum (Pt)	195.09	1250	2000
Selenium (Se)	78.96	13	2000
Tin (Sn)	118.69	5	500
Tellurium (Te)	127.60	25	2000
Titanium (Ti)	47.90	5	100
Thallium (Tl)	204.37	25	2000
Vanadium (V)	50.94	5	2000
Tungsten (W)	183.85	5	200
Yttrium (Y)	88.91	5	1000
Zinc (Zn)	65.37	5	200
Zirconium (Zr)	91.22	5	200

ATOMIC WEIGHTS AND SAMPLING VOLUME FOR METALS

(Based on NIOSH 7300)

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Procedure Title: Organic Vapor Sampling			

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Independent Review: W. Heard 11-1-91

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Effective Date: 11-1-91

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1.0 PURPOSE

This procedure presents the air sampling method for most organic vapors. Some of the organic compounds covered by this method are presented in Appendix A.

By sampling for organic vapors, these workplace hazards will be characterized and proper worker protection can be provided.

2.0 SIGNIFICANCE AND USE

2.1 This sampling method is based in part on U.S. Environmental Protection Agency (EPA) TO-1 and TO-2 methodologies, the American Industrial Hygiene Association Journal article, and Supelco GC Bulletins 846B and 849A. This method employs thermal desorption which has been adopted as a recommended by nonexclusive method in the United Kingdom, West Germany, and the Netherlands but is less widely accepted by the U.S. NIOSH.

2.2 The method employs the Supelco Carbotrap 300 tube containing three adsorbents: Carbotrap C for alkyl benzene, heavier compounds, etc., Carbotrap for C5-C8 compounds, and Carbosieve S-III for vinyl chloride and other light compounds (Appendix B). Volatile organics collected on the tube are desorbed thermally and analyzed by GC/MS. Desorption from the Carbotrap 300 tube is near 100% because of the inert and nonspecific nature of the absorbent and the high desorption temperature.

2.3 The following method is suitable for the types of compounds determined in EPA method TO-1, TO-2, and TO-3 as well as heavier organics. Also, the hydrophobic property of the Carbotrap 300 is very important since water vapor does not displace organic compounds when the humidity is above 60%.

3.0 RESPONSIBILITY

3.1 The Health and Safety Department will determine the applicability of this procedure to special sampling situations. Exceptions to use of this method will also be decided by Health and Safety.

3.2 Health and Safety personnel are responsible to sample for organic vapors using this procedure unless otherwise directed by the Manager of Health and Safety.

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Procedure Title: Organic Vapor Sampling			

4.0 HAZARD ANALYSIS

4.1 This procedure does not present a hazard to the personnel conducting the sampling.

5.0 PRE-JOB PLANNING

5.1 Prerequisites

5.1.1 Ensure an adequate supply of Supelco Carbotrap 300 6mm OD x 4mm ID x 11.5cm tubes or equivalent to sample for the entire job including extra tubes for field quality assurance as explained in Section 6.4. Discern whether the field activity will allow enough time to collect a sample that has a reasonable detection limit. Determine that you will be able to stop the sample before the breakthrough volume of any contaminant of interest is exceeded.

5.2 Requirements

5.2.1 Equipment

- Supelco Carbotrap 300 tube, 6mm OD x 4mm ID x 11.5cm or suitable substitute.
- "Dummy" Supelco Carbotrap 300 tube or "dummy" substitute.
- Tube holder or caps from manufacturer to prevent contamination.
- Clip-on tube holder manufactured for the tube size used.
- Personal sampling pump, low flow, low volume (e.g., Gilian Low Flow Sampler).
- Hose barbs.
- Flexible tubing of appropriate diameter and length.
- Lapel clips.
- Belt or other attachment for pump.

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6.0 INSTRUCTIONS

6.1 Sampling Train

6.1.1 Place the tube (either sample or "dummy") in the clip-on holder with the arrow in the direction of air flow and screw end on tightly. The orientation of the tube in the holder is critical because the Carbotrap C collects the heaviest compounds and allows the rest to pass; the same process occurs in the middle section with the Carbotrap (Appendix B). If the tube orientation is reversed, the tube will not collect properly and the analytical results may be invalid.

6.1.2 Attach the hose barb on the tube holder outlet to tight-fitting flexible tubing. Place any additional clips needed to keep the hose out of the workers way on the hose.

6.1.3 Attach the other side of the flexible tubing to the pump.

CAUTION

All potential air leak locations should be checked according to 6.2.3 to ensure that no additional air is entering the sampling train besides what was calibrated.

6.2 Calibration

6.2.1 Place a "dummy" tube in the holder for calibration only and secure holder.

6.2.2 Fit a hose barb to the inlet side of the tube and attach to the tubing connected to the calibrator. Refer to Calibration of Low Volume Air Sampling Pumps.

6.2.3 Place your finger over the inlet of the tube holder momentarily while the pump is running to assure the sampling train is not leaking. The pump motor should slow down drastically if no leaks are present. **Do not** impair the intake for more than 15 seconds.

6.2.4 Remove the "dummy" tube from the holder.

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6.3 Flow Parameters

6.3.1 Keep the flow rate between 20 and 250 cubic centimeters (milliliters) per minute (cc/min). Flow rates will depend on total recommended sampling volumes, environmental conditions, and time constraints. Flow rates may also need to be lowered after parallel sampling results, as described in Section 6.4, are assessed. Use lower flow rates for the more volatile compounds to ensure sufficient time for the absorbent to capture it.

6.3.2 Sample volumes generally should be kept between 1 and 120 liters for eight hour samples. Breakthrough volumes and maximum sampling times for specific compounds should be referred to Appendix A.

6.3.3 Samples should be collected for the longest period allowed by the anticipated airborne levels, task length, etc. to be the most representative of worker exposure and ensure suitably low detection limits. Another limiting factor is the lowest breakthrough volume out of all the organics to be sampled. That breakthrough volume should not be exceeded. However, if some of the organics to be sampled have much lower breakthrough volumes, they can be collected on a separate tube thus allowing more sample volume to be collected on the other tube.

6.4 Quality Assurance

6.4.1 Field Blanks

6.4.1.1 Between one and ten clean blank tubes will be submitted with every sample set at the rate of one for every ten sample tubes collected. Field blanks will accompany the samples to the field and then to the laboratory without being opened. After analytical results are received, the average from the field blanks may be subtracted from the actual field results.

6.4.2 Parallel Samples

6.4.2.1 At least one set of parallel samples (two or more samples collected simultaneously at the same location) will be collected at flow rates 1/2 to 1/4 of the maximum flow rate for the analyte with the lowest maximum sampling volume (Appendix A) or the higher parallel sample, whichever is greater. The maximum flow rate (in cc/min) is calculated by dividing the maximum sampling

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volume by the desired sampling time (in minutes) and multiplying
Parallel samples should be collected for the same time period. If
agreement between parallel samples is not within $\pm 25\%$, parallel
samples should be collected much more frequently (perhaps even
for all samples).

6.4.3 Backup Tubes

be 6.4.3.1 At least one backup sample (two sorbent tubes in series) should
collected with each set of samples. The backup tube should
contain less than 10% of the organics in the first tube or be equal
to the field blank average, whichever is greater. If these criteria
are not met, H&S should be consulted and backup samples may
need to be collected more frequently. Also, backup tubes may be
used to clarify problems identified by parallel sampling.

6.5 Personnel Sampling Procedure

6.5.1 Attach the sample pump securely to the belt in a position most
comfortable for the worker, usually behind the hip. Run the flexible
tubing under or over the shoulder so that it does not hinder the worker
movement and attach the clip at the tube holder to the lapel or collar
(Appendix C). The tube intake must be placed within two feet of the
workers nose to be in the breathing zone and should be as near the nose as
practical. The tube intake should be pointing up so gravity and air flow
will act to pack the sorbent tightly. If the tube is attached horizontally or
intake down, the charcoal might loosen and separate providing channels
for organics to circumvent the sorbent.

6.5.2 Record the pertinent information on the Sample Data Sheet, Calibration of
Low Volume Air Sampling Pumps.

6.5.3 Place the Carbotrap 300 sample tube in the holder just before starting the
sample pump. Note the time as the pump is turned on and ensure that the
sampling train is functioning properly.

6.5.4 If possible, check the flow rate at the approximate midpoint of sampling
intervals longer than four hours by observing the rotameter.

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6.5.5 Once sampling is completed, turn the pump off, remove the pump from the worker, and record the time and any changes in weather conditions. Remove the tube from the holder and place immediately in the containers supplied with the tube to prevent contamination. Avoid placing the tubes in elevated temperatures (preferably chill tubes) or with other types of organic samples.

6.5.6 Calibrate the pump accordingly. Make a special notation on the Sample Data Sheet if the post-calibration differs by more than 10% from the pre-calibration. Discuss with Health and Safety personnel if a calibration failing this criteria should be submitted for analysis.

6.6 Area Sampling Procedure

6.6.1 Area organic sampling is the same as the personnel sampling in Section 6.5 except ignore sample train placement described in 6.5.1. Place the pump on a stationary support of surface and suspend the tube holder about 5 feet above ground or elsewhere as appropriate for the sample desired. The tube intake should be facing up.

7.0 RECORDS REVIEW AND DISPOSITION

7.1 Record organic vapor sampling information on the Personnel Breathing Zone Sample Data Sheet.

8.0 REFERENCES

- 8.1 Compendium of Methods for the Determination of Toxic Organic Compounds in Ambient Air, U.S. Environmental Protection Agency, EPA/600/4-89/017, 1988.
- 8.2 NIOSH Manual of Analytical Methods (Third Edition) 1987.
- 8.3 Air Sampling Instruments for Evaluation of Atmospheric Contaminants, 7th Edition, American Conference of Governmental Industrial Hygienists, 1989.
- 8.4 "Characterization of Carbon Molecular Sieves and Activated Charcoal for Use in Airborne Contaminant Sampling" in American Industrial Hygiene Association Journal, Betz, W.R., S.G. Maroldo, G.D. Wachob and M.C. Firth, Vol. 50, No. 4, 181-187, 1989.

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8.5 Carbotrap-An Excellent Adsorbent for Sampling Many Airborne Contaminants, Supelco, Inc., GC Bulletin 846B, 1986.

8.6 Efficiently Monitor Toxic Airborne Compounds by Thermal Desorption, Supelco, Inc., GC Bulletin 846B, 1988.

8.7 Simultaneously Monitor Saturated and Unsaturated C2 - C6 Hydrocarbons in Air Samples, Supelco, Inc., Sample Handling Bulletin 850, 1987.

8.8 Hager Laboratories Air Sampling Manual.

9.0 FORMS AND APPENDICES

Appendix A, Break Through Volumes and Maximum Sampling Duration for Organic Adsorbates on Carbotrap 300 tubes.

Appendix B, Carbotrap 300 tube Construction and Direction of Sample Flow.

Appendix C, Illustration

10.0 KEYWORDS

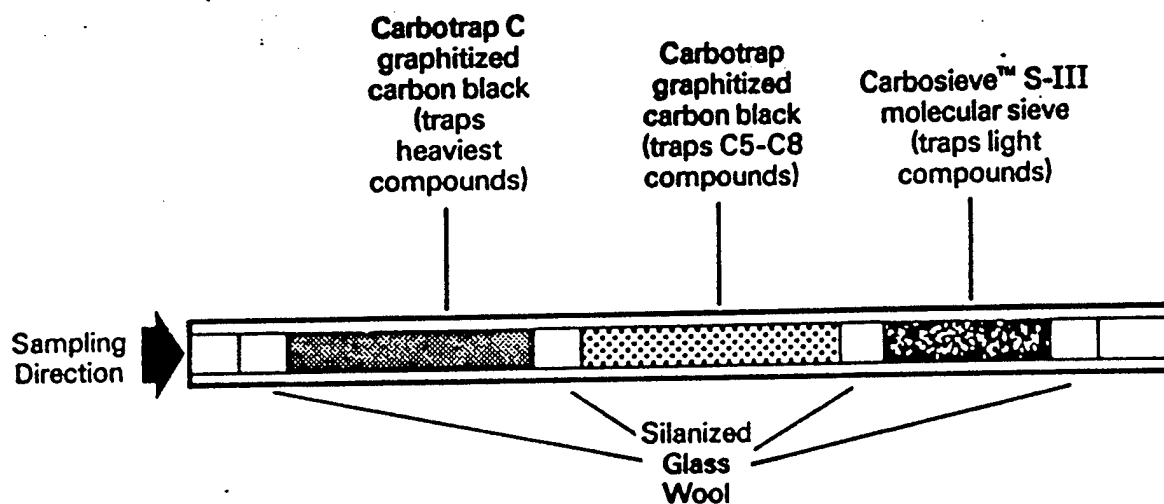
10.1 Organic; Vapor; Airborne Sampling; Thermal Desorption, EPA TO-1, TO-2, TO-3; GC-MS.

BREAK THROUGH VOLUMES AND MAXIMUM SAMPLING DURATION FOR ORGANIC ABSORBATES ON CARBOTRAP 300 TUBES

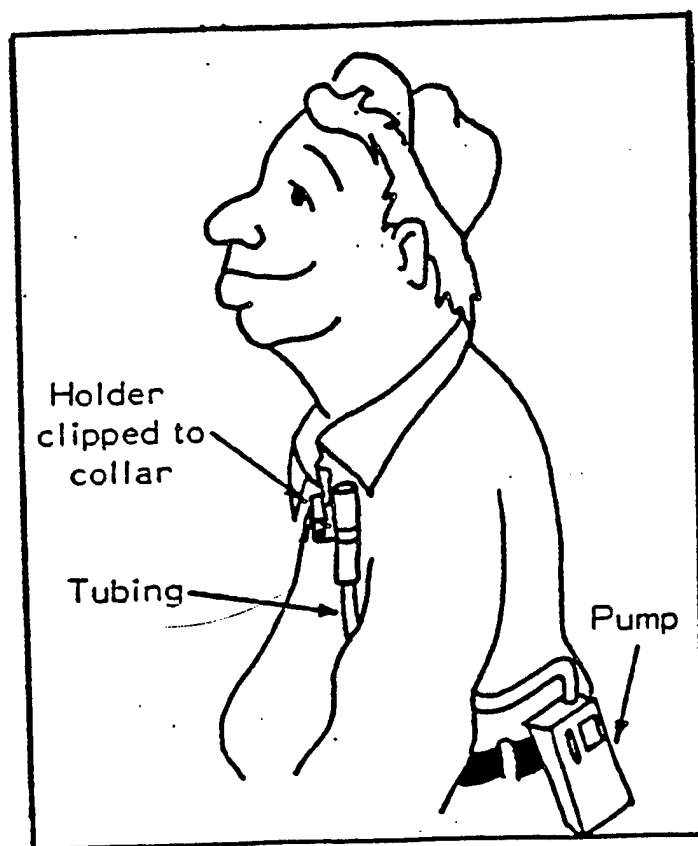
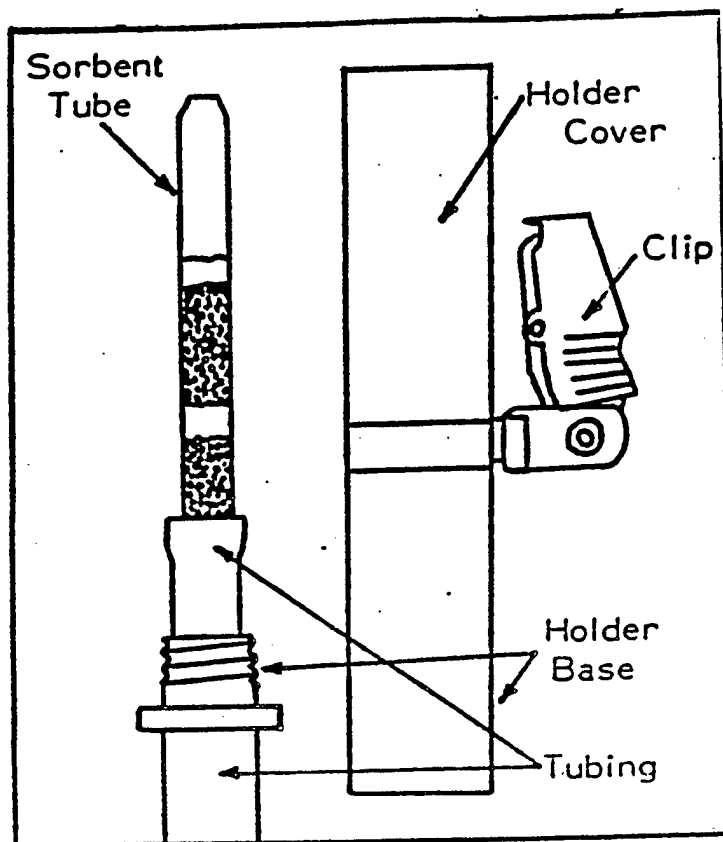
Chemical Name	Break Through Volume (L)	Sample Time for Specific Flow Rates (min.)			
		20 cc/min.	100 cc/min.	200 cc/min.	250 cc/min.
Acetic Acid	0.09	4.5	0.9	0.45	0.36
Acetone	0.01	0.5	0.1	0.05	0.04
Acetophenone	8530	426500	85300	42650	34120
Acrylonitrile	10	500	100	50	40
Allyl Chloride	10	500	100	50	40
Benzene	1.61	80.5	16.1	8.05	6.44
Benzo[a]pyrene	10	500	100	50	40
Benzo[b]fluoranthene	10	500	100	50	40
Benzylamine	2970	148500	29700	14850	11880
Biphenyl	5.0e+08	2.50e+10	5.00e+09	2.50e+09	2.00e+09
Bromobenzene	10	500	100	50	40
Bromochloromethane	10	500	100	50	40
Bromoform	1.1	55	11	5.5	4.4
Bromomethane	10	500	100	50	40
Butane, n-	0.28	14	2.8	1.4	1.12
Butanol, n-	2.56	128	25.6	12.8	10.24
Butanone, 2-	0.5	25	5	2.5	2
Butylamine, n-	277	13850	2770	1385	1108
Butylbenzene, n-	780000	39000000	7800000	3900000	3120000
Butylbenzene, sec-	46	2300	460	230	184
Carbon Tetrachloride	10	500	100	50	40
Chlorobenzene	210	10500	2100	1050	840
Chloroform	0.74	37	7.4	3.7	2.96
Chloro-2-bromopropane, 1-	10	500	100	50	40
Chrysene	10	500	100	50	40
Cresol, p-	2750	137500	27500	13750	11000
Cyclohexanone	272	13600	2720	1360	1088
Decane, n-	638700	31935000	6387000	3193500	2554800
Dibromochloromethane	10	500	100	50	40
Dichlorobenzene, 1,2-	10	500	100	50	40
Dichlorobenzene, 1,3-	10	500	100	50	40
Dichlorobenzene, 1,4-	1790	89500	17900	8950	7160

Chemical Name	Break Through Volume (L)	Sample Time for Specific Flow Rates (min.)			
		20 cc/min.	100 cc/min.	200 cc/min.	250 cc/min.
Dichloroethane, 1,1-	10	500	100	50	40
Dichloroethane, 1,2-	0.27	13.5	2.7	1.35	1.08
Dichloroethylene, 1,1-	10	500	100	50	40
Dichloroethylene, cis-1,2-	10	500	100	50	40
Dichloroethylene, trans-1,2-	10	500	100	50	40
Dichlorofluoromethane	10	500	100	50	40
Dichloropropane, 1,2-	4.5	225	45	22.5	18
Dichloropropane, 1,3-	0.16	8	1.6	0.8	0.64
Dichloropropene, cis-1,3-	10	500	100	50	40
Dichloropropene, trans-1,3-	10	500	100	50	40
Dodecane, n-	2.2e+10	1.09e+12	2.17e+11	1.09e+11	8.68e+10
Ethane	0.82	41	8.2	4.1	3.28
Ethanol	0.07	3.5	0.7	0.35	0.28
Ethylbenzene	2719	135950	27190	13595	10876
Ethylene Dibromide	10	500	100	50	40
Heptane, n-	175	8750	1750	875	700
Heptanone, 4-	325	16250	3250	1625	1300
Heptene, 1-	189	9450	1890	945	756
Hexane, n-	53	2650	530	265	212
Hexylbenzene, n-	9.3e+08	4.65e+10	9.30e+09	4.65e+09	3.72e+09
Isopropylbenzene	22719	1135950	227190	113595	90876
Methyl Chloride	10	500	100	50	40
Methylene Chloride	22.1	1105	221	110.5	88.4
Methyl-2-propanol, 2-	0.86	43	8.6	4.3	3.44
Napthalene	10	500	100	50	40
Nitrosodimethylamine, n-	10	500	100	50	40
Octane, n-	2150	107500	21500	10750	8600
Octylbenzene, n-	1.8e+11	8.75e+12	1.75e+12	8.75e+11	7.00e+11
Pentane, n-	3.9	195	39	19.5	15.6
Pentanoic Acid, n-	57	2850	570	285	228
Phenol	82	4100	820	410	328
phthalate, bis-2-(ethylhexyl)	10	500	100	50	40

Chemical Name	Break Through Volume (L)	Sample Time for Specific Flow Rates (min.)			
		20 cc/min.	100 cc/min.	200 cc/min.	250 cc/min.
Propane, n-	36.4	1820	364	182	145.6
Propionic Acid	0.22	11	2.2	1.1	0.88
Propylbenzene, n-	229300	11465000	2293000	1146500	917200
Tetrachloroethane, 1,1,2,2-	10	500	100	50	40
Tetrachloroethylene	1.5	75	15	7.5	6
Tetradecane, n-	1.1e+13	5.55e+14	1.11e+14	5.55e+13	4.44e+13
Toluene	87	4350	870	435	348
Trichloroethane, 1,1,1-	1.8	90	18	9	7.2
Trichloroethane, 1,1,2-	3.3	165	33	16.5	13.2
Trichloroethylene	1.71	85.5	17.1	8.55	6.84
Trichloroethylene, 1,1,2-	1.7	85	17	8.5	6.8
Trichlorofluoroethane	10	500	100	50	40
Trichloropropane, 1,2,3-	2.23	111.5	22.3	11.15	8.92
Vinyl Chloride	105.3	5265	1053	526.5	421.2
Vinylidene Chloride	10	500	100	50	40
Xylene, m-	5697	284850	56970	28485	22788
Xylene, o-	5697	284850	56970	28485	22788
Xylene, p-	5697	284850	56970	28485	22788



CARBOTRAP 300 TUBE CONSTRUCTION AND DIRECTION
OF SAMPLE FLOW



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Procedure Title: Calibration of Low Volume Air Sample Pumps (Using the Gilibrator Method)			

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Program Manager: He Williams

Effective Date: 11-1-91

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Procedure Title: Calibration of Low Volume Air Sample Pumps (Using the Gilibrator Method)			

1.0 PURPOSE

The purpose of this procedure is to define the methodology for calibration of low volume air sampling pumps (1cc-30 Lpm) using the Gilian Calibrator (Gilibrator).

2.0 DISCUSSION OF SIGNIFICANCE AND USE

2.1 The Gilibrator primary standard air flow calibrator is a high accuracy, electronic bubble flowmeter that provides instantaneous air flow readings and a cumulative averaging of multiple samples. The system provides large dynamic range through the use of three interchangeable flow cell assemblies. A hard copy printer attachment is also available on some units.

2.2 The system consists of the following components:

2.2.1 Control Unit (base) - Contains a LCD readout, DELETE, AVERAGE and RESET push buttons, ON/OFF switch, printer and battery charging connections, and the flow cell mount and jack.

2.2.2 Interchangeable Flow Cells - Cells contain the sensor blocks, soap reservoir, and bubble generation mechanism. They are available in the following sizes:

Low Flow: 1 - 250 cc/min
Standard Flow: 20cc/min - 6 Lpm
High Flow: 2 Lpm - 30 Lpm

2.2.3 Printer Module - Provides a hard copy printout of data.

2.2.4 Battery Charger - Standard wall operated 120v charger.

3.0 RESPONSIBILITY

3.1 It is the responsibility of Health and Safety (H&S) to ensure that the provisions of this procedure are adhered to.

3.2 Individuals utilizing this procedure shall adhere to it as it is written. Discrepancies should be reported to the H&S Manager as soon as possible.

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4.0 HAZARD ANALYSIS AND CONTROL

- 4.1 The flow assembly shall never be pressurized.
- 4.2 Alcohol, acetone and other harsh cleaners shall not be used to clean any component unless approved by the manufacturer.
- 4.3 Body weight shall not be exerted on the flow assembly at any time.
- 4.4 The storage tubing shall be disconnected when transporting the unit via air.
- 4.5 The printer shall not be operated without paper.
- 4.6 Only manufacturer approved connectors shall be used to connect components.
- 4.7 The unit should not be used or stored in damp, wet, or dusty environments or where temperature extremes exist. Additionally, use and storage in direct sunlight should be avoided.
- 4.8 Individual components shall not be disassembled/assembled in any way not addressed in this procedure unless authorized by the manufacturer.
- 4.9 Only the flow assemblies that have the correct range for the target flow rate shall be used, 1/4 - 3/4 full scale is recommended.
- 4.10 The unit being used shall have a current calibration. Attach a defective tag to the unit if calibration has expired.

5.0 PRE-JOB PLANNING

- 5.1 The following items may be required to perform a pump calibration.
 - 5.1.1 Tygon tubing approximately 18 inches long, 5/16 inch in diameter, 1/2 inch outside diameter (2).
 - 5.1.2 Thermometer
 - 5.1.3 Barometer/Altimeter

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5.1.4 Gilian Bubble Generator Soap Solution or approved equivalent.

5.1.5 Gilian Replacement Roll Paper or approved equivalent.

6.0 INSTRUCTIONS

6.1 Use

6.1.1 Ensure the flow assembly to be used is the correct range for the target flow rate.

NOTE

Refer to Appendix A for locations
of various components.

6.1.2 Disconnect the storage tubing from the Air Outlet Boss.

6.1.3 Depress the Bubble Initiate Button and hold. Check to see that the angled edge at the bottom of the Bubble Generator ring is immersed in the soap solution. Add soap solution through the storage tubing, if necessary. Release the Bubble Initiate Button.

NOTE

Calibration set-ups should closely
approximate the field sample set-up.

6.1.4 Connect the air sample pump and sampling media to the Air Outlet Boss via the correct sample media. Ensure media is installed correctly. See Appendix B.

6.1.5 Turn on the air sample pump and adjust it to the target flow rate. Allow pump to run for at least 5 minutes prior to calibration. If several pumps are to be calibrated, they may be warmed up at this time.

6.1.6 Record all required data on the appropriate Sample Data Sheet (Appendix D).

6.1.7 Depress and hold the Bubble Initiate Button to generate one bubble up the column. Release button to initiate another bubble. Continue until bubbles flow smoothly and evenly up the column.

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- 6.1.8 Turn on the power to the base. Wait approximately 10 seconds while the unit runs through the check sequence. The RUN LED will light at this time as well as the LO BAT indicator on the LCD readout. The Gilibrator shall not be used to calibrate until the RUN LED and the LO BAT indicator extinguishes. Ready operation is indicated by a series of 4 dashes on the LCD readout.

NOTE

If the LO BAT indicator fails to extinguish, depress and release the RESET button. If LO BAT continues to display, charge the unit as necessary.

- 6.1.9 Initiate bubbles and adjust flowrate according to pump instructions as necessary to obtain desired flowrate. Do not initiate a second bubble until the cycle is complete.

NOTE

Energize printer at this time (if available).

- 6.1.10 Depress and release the RESET button to clear the Control Unit.

NOTE

If during the calibration run an obvious erroneous reading is obtained (breaking or malformed bubbles are typical causes), press and release the DELETE button to subtract that reading from the cumulative average. On a printout a negative sign will appear next to the reading.

- 6.1.11 Initiate cycles and record each result as required on the Air Sample Procedure. Obtain and record the average flowrate on the appropriate Sample Data Sheet (Appendix C). This is accomplished by pressing and holding the AVERAGE button on the base. Average flowrate will be displayed on the LCD Readout. When printer is in use, average flowrate is automatically displayed on the printout and use of the AVERAGE button is not required.

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6.1.12 When calibration is complete, turn off the air sampler and remove the calibration train from the Gilibrator.

6.1.13 If more calibrations are to be performed, obtain the correct sampling train and flow assembly and repeat steps 6.1.2 through 6.1.12.

6.1.14 When all calibrations are complete, turn-off power to base (and printer attachment) and reconnect storage tubing.

6.2 Storage/Transport

6.2.1 If the unit is to be stored horizontally or transported, remove the flow assembly and drain soap solution out through the Air Inlet Boss.

6.3 Maintenance

6.3.1 Refer to Gilibrator Instruction Manual when performing maintenance.

7.0 RECORDS REVIEW AND DISPOSITION

7.1 All data shall remain with the applicable Sample Data Sheet for filing and retention. These records must be maintained for at least 75 years.

7.2 Personnel Breathing Zone Sample Data Sheets must be copied electronically to make a permanent record. The handwritten Sample Data Sheet must be discarded because the glue fixing the Gilibrator printout to the Sample Data Sheet can deteriorate and fail over time.

7.3 H&S personnel shall review the data generated by use of this procedure.

7.3.1 The H&S Manager or designees signature on the Sample Data Sheet shall indicate a review of the data for quality control.

8.0 REFERENCES

8.1 The Gilibrator Instruction Manual

8.2 Air Sampling Instruments, 7th Edition, 1989

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9.0 FORMS AND APPENDICES

9.1 Gilibrator System Illustration

9.2 Calibration Set-up

9.3 Personnel Breathing Zone Sample Data Sheet

10.0 KEYWORDS

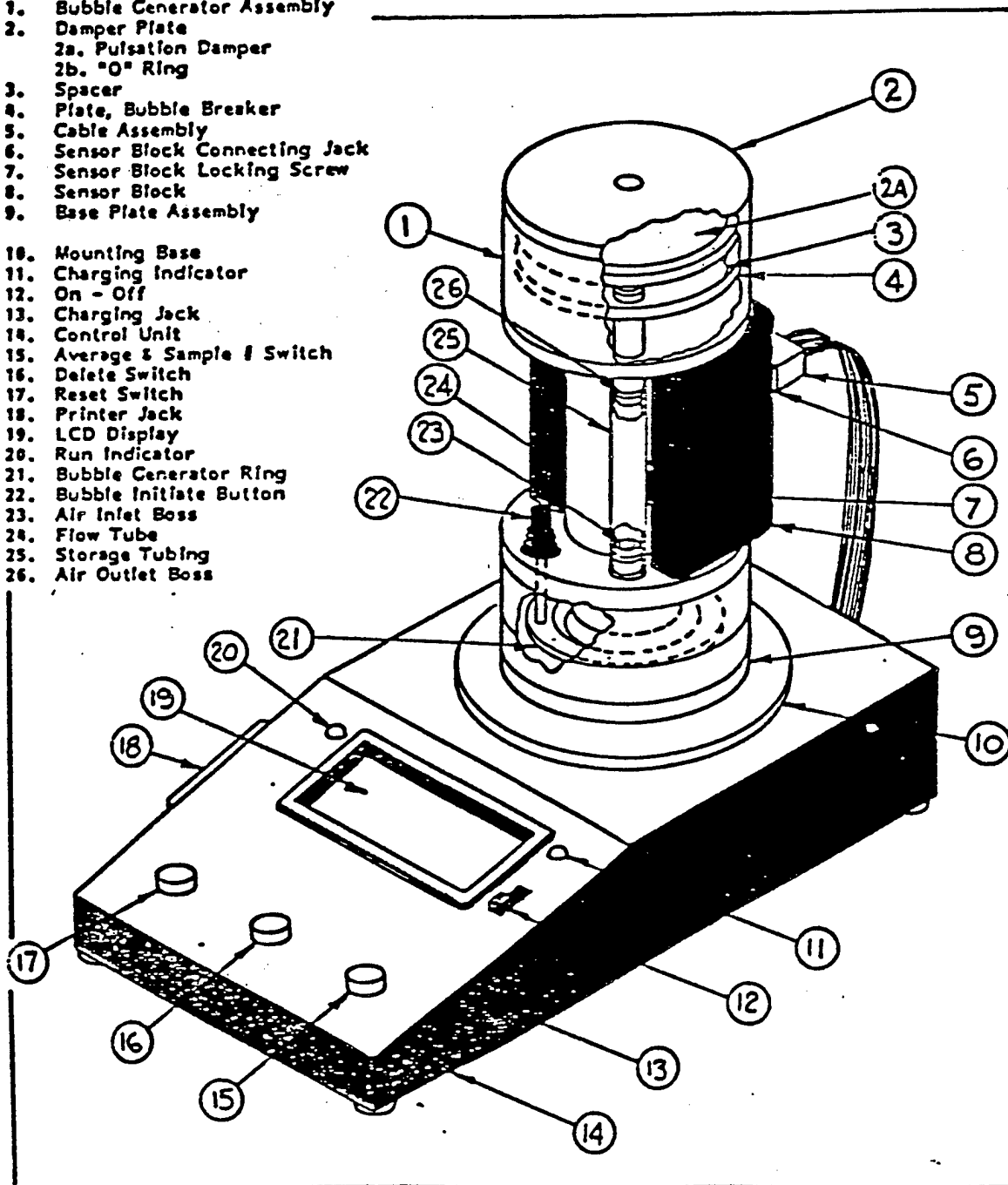
10.1 Gilibrator, Bubble Initiate Button, Primary Standard, Air Flow Calibrator,
Low Volume, Sample Data Sheet

Procedure Title: Calibration of Low Volume Air Sample Pumps
(Using the Gilibrator Method)

APPENDIX A, Page 1 of 1

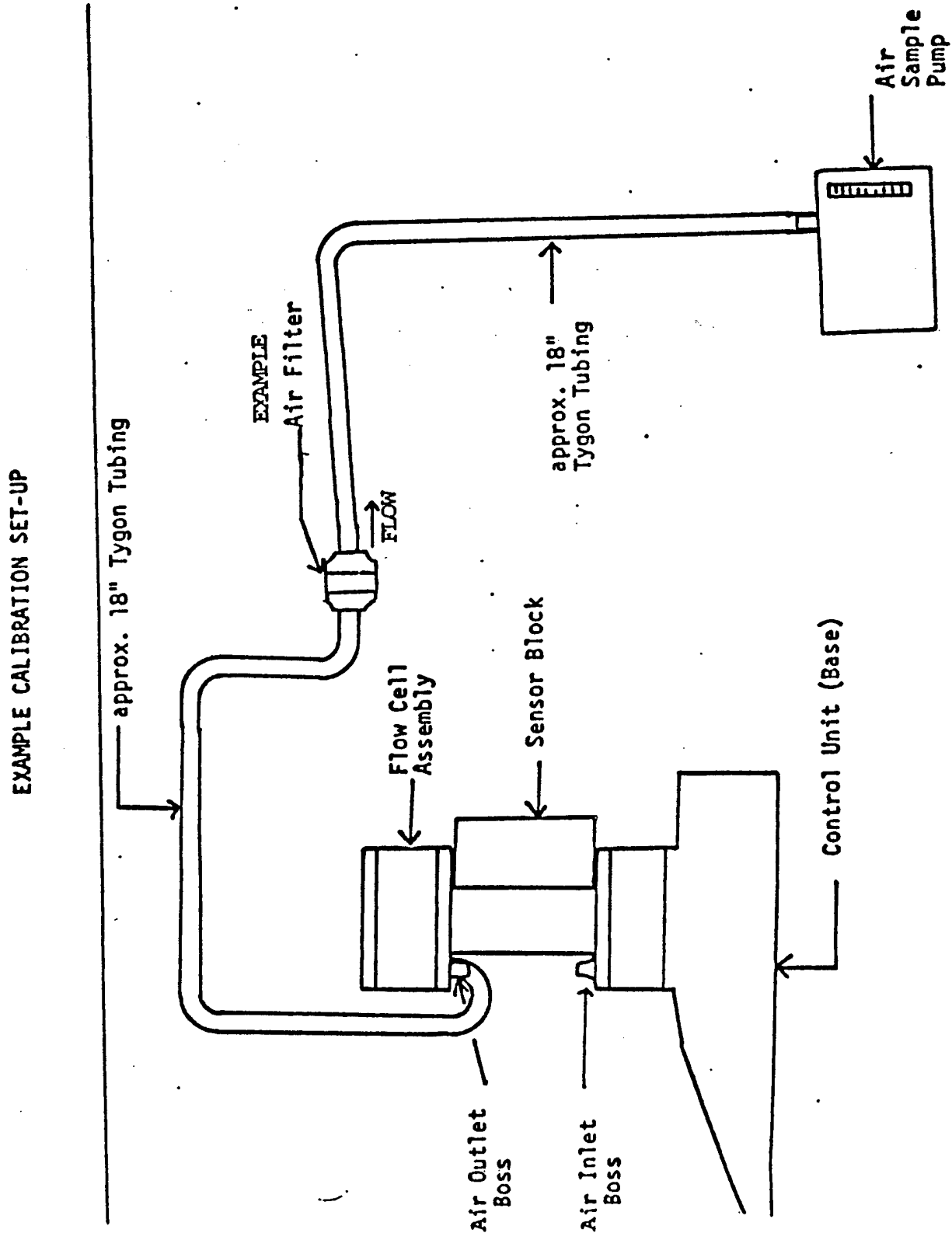
The Gilibrator System
The GilibratorNomenclature

1. Bubble Generator Assembly
2. Damper Plate
 - 2a. Pulsation Damper
 - 2b. "O" Ring
3. Spacer
4. Plate, Bubble Breaker
5. Cable Assembly
6. Sensor Block Connecting Jack
7. Sensor Block Locking Screw
8. Sensor Block
9. Base Plate Assembly
10. Mounting Base
11. Charging Indicator
12. On - Off
13. Charging Jack
14. Control Unit
15. Average & Sample I Switch
16. Delete Switch
17. Reset Switch
18. Printer Jack
19. LCD Display
20. Run Indicator
21. Bubble Generator Ring
22. Bubble Initiate Button
23. Air Inlet Boss
24. Flow Tube
25. Storage Tubing
26. Air Outlet Boss



Procedure Title: Calibration of Low Volume Air Sample Pumps
(Using the Gilibrator Method)

APPENDIX B, Page 1 of 1



Procedure Title: Calibration of Low Volume Air Sample Pumps
(Using the Gilibrator Method)

APPENDIX C, Page 1 of 1

Personnel Breathing Zone Sample Data Sheet

Metals _____ Silica _____ Asbestos _____ Organic Vapors _____

Sample Collected by (print) _____		Date _____
Site Information		Sample Information
Site Code _____	Type <input type="checkbox"/> Personnel <input type="checkbox"/> Area	
Address _____	Worker's Name _____	
Respiratory Protection		
Protection Factor _____		Cartridge/Filter _____
Respiratory Type _____		
Sample Start Conditions		Sample Stop Conditions
Time _____		Time _____
Temperature (°C) _____		Temperature (°C) _____
Pressure (inches Hg) _____		Pressure (inches Hg) _____
Sample Pump Information		Pump Calibrator Information
Type _____		Base No. _____
Model _____		Generator No. _____
Serial No. _____		Maintenance Date _____
Precalibration		Postcalibration
Sample Information		
Sample/Cassette No. _____		Total Sampling Time _____
Average Flow Rate (Lpm) _____		Sample Volume _____
Detailed Description of Activities (job characteristics, environmental conditions, and engineering controls) _____ _____		
Signature of Sample Collector _____		Date _____
Review Signatures		
H&S Manager _____		Date _____
Program Manager _____		Date _____

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Procedure Title: COUNTING SYSTEMS OPERATIONS			

Author Tom Richards Date 11-11-91
Independent Reviewer John Ludlam Date 11-11-91
Program Manager A. Williams Date 11-11-91
Effective Date 11-11-91

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10.0 KEYWORDS	
10.1 Source Check, Chi-Square, LLD, MDC, MDA	

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1.0 PURPOSE

- 1.1 The purpose of this procedure is to provide instructions for performance testing and operation of laboratory scaler counting systems.

2.0 DISCUSSION OF SIGNIFICANCE AND USE

- 2.1 Precision - the repeatability of a measurement.
- 2.2 Accuracy - the comparison of the measurement to the true value of the parameter.
- 2.3 Systematic error - a type of error which occurs repeatedly in the same magnitude. Systematic error is a function of the measurement system, and can usually be measured or calculated since the magnitude of the error is constant.
- 2.4 Random error - an error found in physical measurements which is unpredictable in occurrence, these errors will fall into a discernible trend with some values occurring with a higher probability than others.
- 2.5 Cumulative error - a combination of all error contributions in a measurement system.
- 2.6 Measurement - a process by which the parameters of an object or group of objects are determined by a comparison process.
- 2.7 Chi squared (χ^2) test - This test is used to determine if fluctuations in measurements are of statistical origin or possibly caused by a malfunction in some part of the counting system.
- 2.8 Efficiency - The ratio of counts per minute to disintegrations per minute of a known standard.
- 2.9 Standard Deviation (σ) - A measure of the statistical variance in a given set of counts if only random changes occur.
- 2.10 Lower Limit of Detection (LLD) - an a priori (before the fact) estimate of the detection capabilities of a counting system.
- 2.11 Minimum Detectable Activity (MDA) - an a posteriori (after the fact) determination of the measurement capability of a system directly related to the characteristics of a specific sample and sample counting system.

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2.0 (cont.)

- 2.12 gcpm - gross counts per minute, the total counts recorded which will include any background contribution.
- 2.13 cpm - the net counts per minute which do not include any background contribution.
- 2.14 dpm - disintegrations per minute, 2.22E6 disintegrations per minute per microcurie.

3.0 RESPONSIBILITY

- 3.1 The Manager, Health and Safety is responsible for implementing the requirements of this procedure.

4.0 HAZARD ANALYSIS AND CONTROLS

- 4.1 Use caution when handling samples to avoid spreading contamination and/or altering sample contents.
- 4.2 If high levels of sample activity are suspected, screen samples using a hand held count rate instrument to avoid the potential for contaminating the scaler. Samples in excess of 50,000 disintegrations per minute should not be counted on scalers. Use only hand held instrument count rate data for evaluation of these samples.
- 4.3 If a sample with detectable radioactivity is not to be retained for subsequent counting it should be disposed of as Radioactive Waste.
- 4.4 When counting a large number of samples, periodically perform a five minute background count to verify the uncontaminated status of the counting system.
- 4.5 Samples should be placed in a clean planchet prior to placing the sample in the counting geometry, this will preclude contamination of the sample holder.

5.0 PRE-JOB PLANNING

- 5.1 Ensure scalers have been calibrated within the last six months. If the instrument has exceeded its calibration due date, mark the instrument "Defective" and submit it to the calibration facility for recalibration.

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6.0 INSTRUCTIONS

6.1 Long Term

6.1.1 General - Long term performance checks include chi-square, source confidence level, and efficiency determination.

6.1.1.1 Long term performance checks shall be performed after calibration.

6.1.1.2 A Chi-Squared (X^2) test is required for the affected channel/scaler anytime three out of five source checks fall outside the error limits. Anytime a X^2 test is performed, new error limits shall be prepared in accordance with Step 6.1.3.

6.1.1.3 Long term checks shall be documented on Appendix A, "Long Term Performance Check Log Sheet".

6.1.2 Chi-Squared Test

6.1.2.1 Perform a ten-minute background count, divide the total counts by the count time (10) to calculate background counts per minute.

6.1.2.2 Obtain a National Bureau of Standards (NBS) traceable source of the appropriate geometry, activity, and energy for the system being tested.

6.1.2.3 Perform 20 - one minute counts (gcpm), subtract the background cpm from step 6.1.2.1 obtaining (x).

6.1.2.4 Sum the results (Σx), divide by 20 to get the average cpm (\bar{x}).

6.1.2.5 Subtract the average cpm (\bar{x}) from each of the 20 minute counts (x), and square the results $(x - \bar{x})^2$.

6.1.2.6 Sum the squares $\Sigma(x - \bar{x})^2$.

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NOTE

Chi-Squared (X^2) should be between 8.9 and 32.9. If not, repeat this procedure. If Chi-Squared still fails, reject the instrument and turn it in for repair and calibration.

6.1.2.7 Divide by the average cpm (\bar{x}), to determine Chi-Squared (X^2).

$$X^2 = \frac{\sum (x - \bar{x})^2}{\bar{x}}$$

6.1.2.8 Attachment 1 shows an example of a Long Term Performance Check Logsheet.

6.1.3 Source Confidence Level

6.1.3.1 Calculate the standard deviation as follows:

$$2\sigma = 2 \sqrt{\frac{\sum (x - \bar{x})^2}{N - 1}}$$

Where:

2σ = Standard Deviation for a 95% confidence level.

$\sum (x - \bar{x})^2$ = from Step 6.1.2.6.

N = number of source counts (20)

6.1.3.2 Confidence interval is the average source cpm (\bar{x}) from Step 6.1.2.4 $\pm 2\sigma$.

6.1.3.3 Record the confidence level on Appendix B and Appendix C (if used).

6.1.4 Efficiency Determination

NOTE

If the source used for the efficiency determination is the same source as used in Section 6.1.2 (Chi-Squared), use average cpm(\bar{x}) from Step 6.1.2.2 and proceed to Step 6.1.4.4.

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6.1.4.1 Select a source of appropriate geometry, activity, and energy for the counting system as determined by a Radiological and Environmental Safety Health Physicist, or Operational Health and Safety Supervisor. The minimum acceptable countrate is approximately 500 cpm. Higher countrates, up to 50% of the maximum countrate of the instrument are acceptable.

6.1.4.2 Perform 20 - one minute counts, sum the results and divide by the number of specific counts to determine the average cpm.

6.1.4.3 Subtract background

6.1.4.4 Calculate efficiency as follows;

$$\text{Efficiency} = \frac{\bar{x}}{\text{source dpm}}$$

Where:

\bar{x} = average cpm from Step 6.1.4.3

source dpm = decay corrected activity in dpm from the source certification.

6.1.5 Forward the completed Appendix A to Health and Safety Management for review.

6.2 Daily Performance Checks

6.2.1 General

NOTE

Background and source checks shall be performed daily or prior to use, whichever is less frequent.

6.2.1.1 Verify that long term performance tests have been performed since calibration and applicable data is recorded on Appendix B (Daily Performance Check Log Sheet) and Appendix C. (Daily Performance Check Control Graph).

6.2.1.2 Ensure any applicable parameters (e.g., high voltage) is set in accordance with the most recent instrument calibration.

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6.2.2 Background

- 6.2.2.1 Perform background count with a clean filter installed in the sample holder.

NOTE

For routine sampling, the recommended background counting time is 60 minutes. Background countrate should not exceed a value which would preclude achieving the desired Lower Limit of Detection (LLD).

- 6.2.2.2 Record total counts on Appendix B.

- 6.2.2.3 Divide the total counts by the counting time to determine cpm, record this value on Appendix B.

6.2.3 Source Check

- 6.2.3.1 Perform a 10 minute source count using the same source as used in Section 6.1.3.

- 6.2.3.2 Divide total counts by count time and subtract background to determine the net cpm.

- 6.2.3.3 Compare the results with the confidence interval determined in Section 6.1.3.

- 6.2.3.4 If the results fall within the 2σ Confidence Interval the source check is satisfactory.

- 6.2.3.5 If the results are not within the 2σ Confidence Interval, repeat Section 6.2.3.

- 6.2.3.6 If the source check fails on three out of five consecutive counts, perform Section 6.1.2 (Chi-Squared) of this procedure.

- 6.2.4 Forward the completed Appendix B to H&S for review.

6.3 Sample Counting and Calculations

6.3.1 General

- 6.3.1.1 When net counts per minute are less than the minimum detectable counts, record the results as "<LLD" and calculate the lower limit of detection per 6.3.7.

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6.3.2 Smears

6.3.2.1 Smears may be counted for gross beta-gamma on either a frisker or scaler, whichever is more practical.

6.3.2.2 Smears must be counted for alpha using a scaler.

6.3.2.3 When counting smears on a scaler, normal count times are:

Beta-gamma	one minute
Alpha	five minutes

6.3.2.4 Calculate Activity

$$\text{dpm} = \frac{\text{net counts(cpm)}}{\text{efficiency} \times \text{area}}$$

6.3.2.5 Record results on the applicable survey map.

6.3.2.6 Forward results to the Manager of Health and Safety or Supervisor/designee for review.

6.3.3 Air Samples

NOTE

To preclude interference of short-lived natural isotopes, sample counting may be delayed.

6.3.3.1 Perform a twenty minute count using a Ludlum 2000 or equivalent. Longer count times may be required for short duration air samples to meet the LLD requirements of Section 6.3.7.

6.3.3.2 Calculate activity concentration in accordance with Section 6.3.3.7.

6.3.3.3 If sample activity is > than 100% of the most restrictive limit the sample should be sent to the analytical laboratory for isotopic analysis or a half-life determination performed in accordance with Section 6.3.4.

6.3.3.4 If the results are <MDC, ensure that sample results are <LLD by re-evaluating background, counting the sample for a longer period, or increasing the sample volume.

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6.3.3.5 Record the results in the remarks section of the Air Sample Data Sheet for the appropriate job/location.

6.3.3.6 Forward the results to the Manager of Health and Safety or Supervisor/designee for review.

6.3.3.7 Calculate Activity

$$\mu\text{Ci/ml} = \frac{(\text{net cpm}) * 4.5\text{E-}7}{\text{efficiency} * \text{volume}}$$

Where:

net cpm = sample cpm - background cpm

4.5E-7 = conversion of dpm to μCi

efficiency = counting system efficiency

volume = sample volume in ml

6.3.4 Half-life

6.3.4.1 To determine apparent $t_{1/2}$, recount the sample approximately 20 minutes after the initial count and determine the activity.

6.3.4.2 Calculate the half-life as follows:

$$t_{1/2} = \frac{-0.693 \delta T}{\ln (A_2/A_1)}$$

Where:

$t_{1/2}$ = half-life

0.693 = decay constant

δT = time between sample counts

A_1 = activity at first sample count

A_2 = activity at second sample count

6.3.4.2 Record this data in the remarks section of the air sample data sheet.

6.3.5 Long-Lived Alpha

6.3.5.1 Count the sample at least six hours after sample collection, then again approximately ten hours later (16 hours after sampling).

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6.3.5.2 Calculate long-lived alpha as follows:

$$\text{alpha (LL)} = A_2 - [A_1 e^{-0.065(\delta T)}]$$

Where:

A_1 = six hour count activity

A_2 = sixteen hour count activity

δT = time between A_1 and A_2

0.065 = decay constant for ^{212}Pb

6.3.5.3 If LL alpha is ≤ 0 , assume all activity to be short-lived.

6.3.5.4 If LL alpha is > 0 , notify the Manager of Health and Safety.

6.4.5.5 Record this data in the remarks section of the air sample data sheet.

6.3.6 Calculate MDC as follows:

$$\text{MDC} = 1.645 \sqrt{\frac{C_b}{T_b} + \frac{C_b}{T_s}}$$

Where:

C_b = background countrate in cpm

T_b = background count duration in minutes

T_s = sample count duration in minutes

1.645 = factor for 90% confidence

6.3.7 LLD

NOTE

The Lower Limit of Detection (LLD) may vary dependent on the isotopic mix identified at a specific location. The most restrictive isotope identified during initial assessment of a specific project should be used for the air sampling LLD.

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6.3.7.1 The LLD for sample should meet the following criteria:

air samples	7E-13 $\mu\text{Ci}/\text{ml}$
smears(beta-gamma)	1000 dpm
smears(alpha)	20 dpm

6.3.7.2 LLD is determined by inserting MDC, as calculated in Step 6.3.6, into the sample activity formula for the given analysis.

6.3.7.3 Calculate LLD as follows:

$$\text{LLD} = \frac{(\text{MDC}) * (4.5\text{E}-7)}{(\text{eff}) * (\text{area or volume})}$$

Where:

MDC = minimum detectable count rate

eff = counting system efficiency

4.5E-7 = conversion of dpm to μCi (for air samples)

area or volume = in cm^2 or ml respectively as appropriate

6.3.7.3 Record this value in the remarks section of the air sample data sheet.

6.4 Scaler Operations

6.4.1 BC-4

NOTE

Daily performance checks must be completed prior to sample counting.

6.4.1.1 Verify that the instrument calibration is current. If the instrument calibration interval has been exceeded tag the instrument **DO NOT USE** and return the instrument to the calibration facility for recalibration.

6.4.1.2 Visually inspect the instrument for any physical damage, if any damage is apparent submit the instrument to the calibration/repair facility for repairs.

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- 6.4.1.3 Ensure count time switches are set for the desired count time. Verify that the time scale multiplier switch is properly positioned for the desired time setting.
- 6.4.1.2 Place the sample in the sample holder with the collection side up.
- 6.4.1.3 Press Reset/Start. When the count is completed, the BC-4 will display total counts.
- 6.4.1.4 Calculate sample activity in accordance with Section 6.3.
- 6.4.1.5 Record the results on the appropriate form (e.g., survey map or Air Sample Data Sheet).
- 6.4.2 Ludlum 2000 (in conjunction with either the Ludlum 43-9 or 43-10)

CAUTION

Verify that the time scale multiplier switches are properly set to achieve the desired counting time.

- 6.4.2.1 If the Model 2000 is coupled with the Model 43-10 detector the sample holder is reversible to accommodate either air sample filters from the personnel air monitoring pumps or the larger filters utilized by the high volume air samplers or smears. Ensure the appropriate side is facing up and the long term and daily instrument checks have been completed for the selected geometry.
- 6.4.2.1 If the instrument is to be operated from line power, connect a power cord from the scaler rear panel 115v, 60 Hz connector and the line voltage source. Energize the instrument by placing the "POWER" switch in the "LINE" position.
- 6.4.2.2 If the instrument is to be operated from battery power, energize the instrument by placing the "POWER" switch in the "BAT" position, verify that the battery check read out indicates above the "BAT TEST" line by placing the "BAT-HV TEST" switch to the "BAT" position. If the battery power is insufficient, replace the batteries and repeat the preceding checks.
- 6.4.2.3 Ensure the count time thumb wheels are properly set for the desired counting time.

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NOTE

For the Ludlum 2000 scaler configured with the Ludlum 43-10 detector ensure the sample holder is fully inserted and locked. The counting sequence will not start until the holder is fully inserted and locked.

6.4.2.4 Place the sample in the sample holder with the collection side up.

6.4.2.5 Press the count switch. When the count is complete, the Ludlum 2000 will display total counts.

6.4.2.6 Calculate the sample activity in accordance with Section 6.3.

6.4.2.7 Record the results on the appropriate form (e.g., survey map or Air Sample Data Sheet).

6.4.3 Ludlum 2929 utilizing the Ludlum 43-10-1 detector

CAUTION

Verify that the time scale multiplier switches are properly set to achieve the desired counting time.

6.4.3.1 The sample holder is reversible to accommodate either air sample filters from the personnel air monitoring pumps or the larger filters utilized by the high volume air samplers or smears. Ensure the appropriate side is facing up and the long term and daily instrument checks have been completed for the selected geometry.

6.4.3.1 Ensure the count time thumb wheels are properly set for the desired counting time.

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NOTE

For the Ludlum 2929 scaler configured with the Ludlum 43-10-1 detector ensure the sample holder is fully inserted and locked. The counting sequence will not start until the holder is fully inserted and locked.

- 6.4.3.2 Place the sample in the sample holder with the collection side up.
- 6.4.3.3 Press the count switch. When the count is complete, the Ludlum 2929 will display total counts for alpha and beta-gamma on independent displays.
- 6.4.3.4 Calculate the sample activity in accordance with Section 6.3. for both the alpha and the beta-gamma emitters.
- 6.4.3.5 Record the results on the appropriate form (e.g., survey map or Air Sample Data Sheet).

7.0 RECORDS REVIEW AND DISPOSITION

- 7.1 Data sheets generated through this procedure shall be maintained in accordance with CWM/CNES policy.

8.0 REFERENCES

- 8.1 DOE Order 5480.11, Radiation Protection for Occupational Workers
- 8.2 Radiation Detection and Measurement, Glenn F. Knoll, Wiley & sons
- 8.3 Ludlum Model 2929 scaler instruction manual
- 8.4 Ludlum Model 2000 scaler instruction manual
- 8.5 ANSI N323-1978, Radiation Protection Instrumentation Test and Calibration

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LONG TERM PERFORMANCE CHECK LOG SHEET

LONG TERM PERFORMANCE CHECK LOGSHEET

Facility/Project Location _____

Scaler Model _____ Serial Number _____ Calibration Due Date _____

Detector Model _____ Serial Number _____

Source Isotope _____ Source Geometry _____ Source Activity _____ dpm Assay Date _____

SECTION A:

Chi-Squared (χ^2) Determination

Background = _____ cpm

n	gcpm	x	x - \bar{x}	(x - \bar{x}) ²
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14				
15				
16				
17				
18				
19				
20				

$\bar{x} =$ _____ $\sum (x - \bar{x})^2 =$ _____

SECTION B:

Source Confidence Level Determination

$$2s = 2\sqrt{\sum (x - \bar{x})^2 / 19}$$

Confidence Interval = $\bar{x} \pm 2s$

$$\bar{x} = \sum x / 20$$

$$= \frac{\quad}{20}$$

$$= \quad \text{cpm}$$

SECTION C:

Efficiency Determination

Efficiency = $\bar{x} / \text{source activity (dpm)}$

$$\chi^2 = \sum (x - \bar{x})^2 / \bar{x}$$

$$= \frac{\quad}{\quad}$$

$$= \frac{\quad}{\quad}$$

Chi-Squared Limits:
10.1 to 30.1

Chi-Square Pass/Fail(circle one)

COMMENTS:

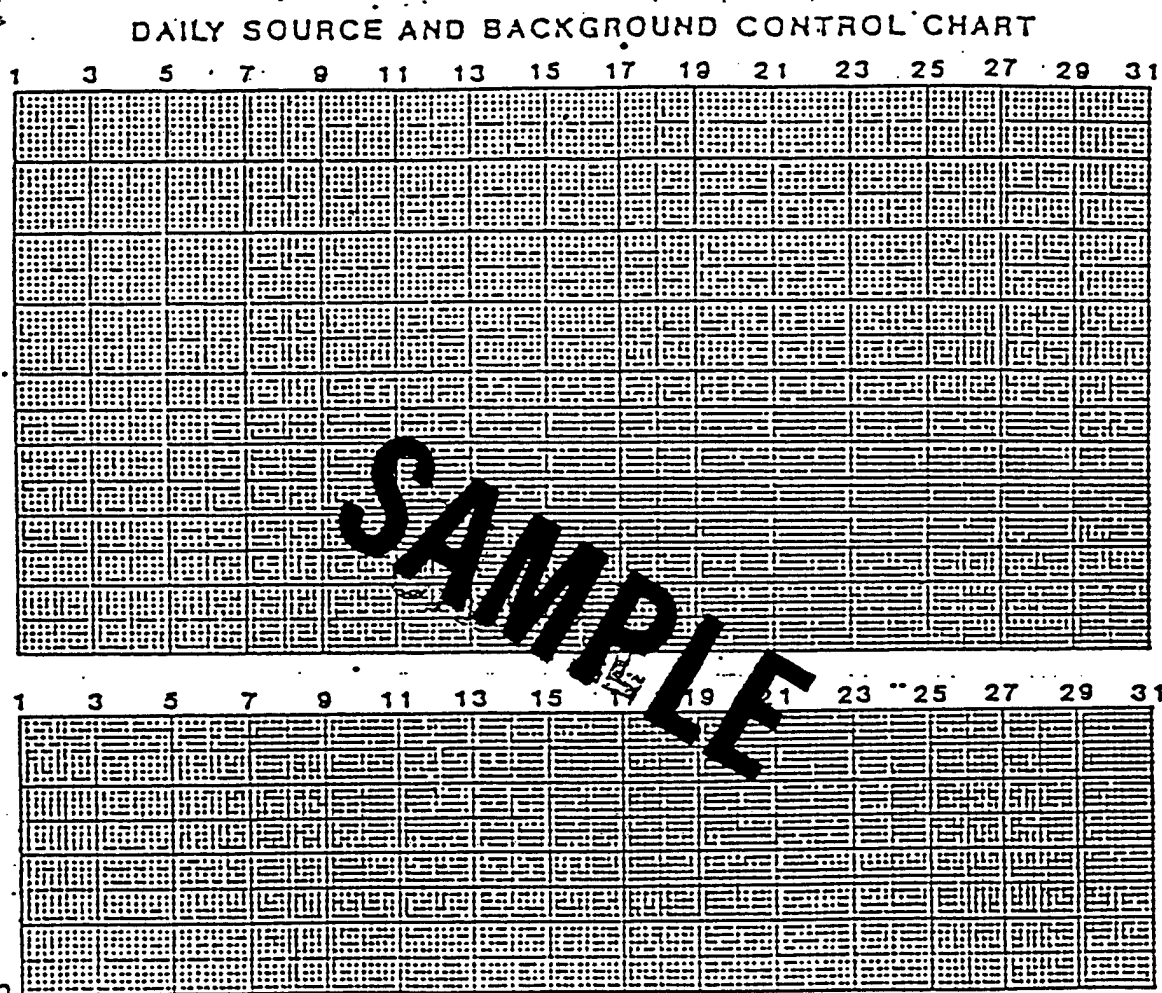
EXAMPLE

Performed By: _____
print name signature date

Reviewed By: _____
print name signature date

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DAILY SOURCE AND BACKGROUND CONTROL CHART



SCALER MODEL: _____ DATE: _____ / _____ / _____
 SERIAL # _____ MONTH YEAR
 CAL. DATE: _____ EFFICIENCY.....
 DATE DUE: _____ AVG. SOURCE CHECK COUNT: _____
 _____ 2-σ CONFIDENCE INTERVAL
 _____ TO _____

Reviewed by: _____ / _____ DATE

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Attachment 1
Example Long Term Performance Check Logsheet

LONG TERM PERFORMANCE CHECK LOGSHEET

Facility/Project Location _____

Scaler Model Ludlum 2000 Serial Number _____ Calibration Due Date 11-30-90

Detector Model _____ Serial Number _____

Source Isotope Tc-99 Source Geometry 1" disc Source Activity 2326 dpm Assay Date 8-1-90

SECTION A:

Chi-Squared (χ^2) Determination

Background = 3 cps

n	gcpm	x	x - \bar{x}	(x - \bar{x}) ²
1	400	397	1.05	1.10
2	388	385	-10.95	119.90
3	415	412	16.05	257.60
4	427	424	23.05	786.20
5	412	409	13.05	170.30
6	389	385	-10.95	119.90
7	410	407	11.05	122.10
8	377	374	-21.95	481.80
9	412	409	13.05	170.30
10	421	418	22.05	486.20
11	390	387	-8.95	80.10
12	419	416	20.05	402.00
13	380	377	-13.95	359.10
14	414	411	15.05	226.50
15	386	383	-12.95	167.70
16	392	389	-6.95	48.30
17	410	407	11.05	122.10
18	379	376	-13.95	359.10
19	374	371	-24.95	622.50
20	385	382	-13.95	119.90

$\bar{x} = 7919$ $\sum (x - \bar{x})^2 = 5262.25$

SECTION B:

Source Confidence Level Determination

$$\pm z = \sqrt{2 \sum (x - \bar{x})^2 / 19}$$

Confidence Interval = $\bar{x} \pm 20$
 $= 7919 \pm 20$
 $= 7899$
 $= 362.21$ to 428.79 cps

$\bar{x} = 7919$
 $= 7919$
 $= 395.5$ cps

SECTION C:

Efficiency Determination

Efficiency = \bar{x} / source activity (dpm)

$= \frac{395.5}{2326}$
 $= 0.17$

$\chi^2 = \sum (x - \bar{x})^2 / \bar{x}$
 $= \frac{5262.25}{395.5}$
 $= 13.29$

Chi-Squared Limits:
10.1 to 30.1

Chi-Square (Pass/Fail (circle one))

COMMENTS: This logsheet was performed for demonstrative purposes only.
DB

SAMPLE

Performed By: Joe Tech / Joe Tech / 8-14-90
 print name signature date

Reviewed By: DP. Super / DP. Super / 8-14-90
 print name signature date

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Author J. Richards Date 11-11-91
Independent Reviewer John Ludlam Date 11-11-91
Program Manager George Williams Date 11-11-91
Effective Date 11-11-91

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1.0 PURPOSE

- 1.1 The purpose of this procedure is to identify the methods for the functional testing of radiation protection instrumentation.

2.0 DISCUSSION OF SIGNIFICANCE AND USE

- 2.1 Geotropism - Effect of gravity on a meter needle.
- 2.2 Operability - For Radiation Protection instrumentation, operable means the instrument has properly responded to a known source, has good batteries, is calibrated, and has no obvious physical defects which may impair its function.
- 2.3 Angular dependencies - Erroneous meter readings caused when orientation of detector to source is not in the same configuration as it was during instrument calibration.

3.0 RESPONSIBILITY

- 3.1 Health and Safety is responsible for:
 - 3.1.1 Maintaining records for each instrument to track its operability check history.
 - 3.1.2 Ensuring instruments used for surveys are fully operable and to reject for repair any instruments found to be defective.
 - 3.1.3 Performance of necessary response checks prior to the use of an instrument.

4.0 HAZARD ANALYSIS AND CONTROLS

- 4.1 Using an uncalibrated instrument or an instrument which has not passed a satisfactory source response check will invalidate any resulting survey data.
- 4.2 Sources required for response checks shall be handled only by a qualified source handler.

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5.0 PRE-JOB PLANNING

5.1 Resources

- 5.1.1 Sources of appropriate quantity to provide a response in the desired range.

5.2 Precautions

- 5.2.1 Utmost care should be observed at all times when handling radioactive sources.

6.0 INSTRUCTIONS

6.1 Pre-Operational Checks

- 6.1.1 Response checks of instruments shall be performed daily or prior to each use, whichever is less frequent.
- 6.1.2 Perform a battery check in accordance with the operating instructions for the instrument to be used.
- 6.1.3 Inspect the instrument for physical defects which may impair its ability to operate. This inspection should include the cable and connections, meter, instrument controls, and case.

NOTE

Calibrations expire at 2400
on the stated expiration date.

- 6.1.4 Ensure a valid calibration sticker is attached and the calibration has not expired.

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6.2 Response Checks

NOTE

Instruments with auto-ranging feature shall be checked at a minimum on the low end and mid-range.

- 6.2.1 Response checks of instruments shall be performed daily or prior to each use, whichever is less frequent. Response checks shall be performed on all scales intended for use. (Portable countrate meters need only be checked on one scale.)
- 6.2.2 Obtain a source with an activity level appropriate for the instrument type and ranges. Use Th-230 for alpha survey instruments, Tc99 for beta/gamma survey instruments and Sr90 for dose rate instruments.
- 6.2.3 Expose the detector to the source. Hand held probes shall be exposed using the appropriate source holder. Dose rate instruments shall be in contact with the source and the detector centered on the source. Dose rate instruments shall be checked on each scale at mid-range (when feasible).
- 6.2.4 The response checks shall be within $\pm 20\%$ of the expected value.
- 6.2.5 Record the results of the response check on the "Instrument Response Check Record", Appendix A.
- 6.2.6 Cause the instrument to alarm (if applicable). Ensure any audible or visual alarms functions.
- 6.2.7 Instruments should be marked to indicate that they were response checked for that day.

6.3 Beta Correction Factors

- 6.3.1 Beta correction factors (BCF) shall be determined prior to obtaining beta dose rates or monthly whichever is less frequent.
- 6.3.2 Obtain a depleted uranium slab, nominal dose rate 239 mRAD/hr.

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6.3.3 Center the detector on the slab with the window closed. Record this reading on "Beta Correction Factors Calculation" Appendix B.

6.3.4 Open the detector window and center on the slab. Record this reading on Appendix B.

6.3.5 Perform the BCF calculation. If the BCF is ≤ 4.0 , post BCF = 4.0 on the instrument. If the BCF is > 4.0 , post the actual BCF.

7.0 RECORDS REVIEW AND DISPOSITION

7.1 Instrument calibration and response checks shall be maintained.

7.2 Instrument response check records shall be reviewed by Health and Safety.

7.3 Beta correction factor records shall be reviewed by OH&S supervision and forwarded to the Electronics Laboratory for filing and retention.

8.0 REFERENCES

8.1 ANSI N323-1978, *Radiation Protection Instrumentation Test and Calibration*

8.2 INPO 85-004, *Guidelines for Radiological Protection at Nuclear Power Stations*

9.0 FORMS AND APPENDICES

9.1 Appendix A, *Instrument Response Check Record*

9.2 Appendix B, *Beta Correction Factor Calculation*

10.0 KEYWORDS

10.1 Response check, calibration, instrument

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Beta Correction Factor Calculation

BETA CORRECTION FACTOR CALCULATION

Technicians Name (Print): _____ Date: _____

Source ID#: _____ Source Rating (mRad/hr): _____

$$BCF = \frac{SR}{OW - CW}$$

Where: BCF = Beta Correction Factor
 SR = Source Rating (mRad/hr)
 OW = Open Window Meter Reading
 CW = Closed Window Meter Reading

EXAMPLE

BCF = _____ = _____

Note: If calculated BCF \leq 4.0, Post 4.0

If calculated BCF $>$ 4.0, post actual BCF

POSTED

BCF = _____

Technicians

Signature: _____

Supervisors

Signature: _____

Date: _____

APPENDIX H
UNEXPLODED ORDNANCE PROCEDURES

1.0 INTRODUCTION

There are a variety of safety precautions, both general and specific, which relate to Ordnance Explosive Waste (OEW) operations. These related safety precautions should be consulted and complied with, as appropriate to the operation or situation. By nature, OEW operations are hazardous, and certain calculated risks must be taken. Considerations such as ingenuity, judgment, common sense, and above all, the mastery of Explosive Ordnance Disposal (EOD) techniques and observance of EOD principles will determine success or failure. The below-listed safety precautions are general in nature and are applicable to EOD/OEW operations involving ordnance of all nations.

2.0 GENERAL SAFETY PRECAUTIONS

The following general safety precautions are applicable to OEW related operations.

- a. During EOD/OEW operations, only the minimum number of personnel essential to the operation should be present in the vicinity. EOD/OEW operations will normally be conducted by a minimum of two EOD technicians.
- b. Do not allow unauthorized or unnecessary personnel to be present in the vicinity of possible hazardous explosive ordnance or when EOD/OEW operations are pending or in progress.
- c. Personnel working with explosives and explosive ordnance shall comply with the following:
 - 1) Do not carry fire- or spark-producing devices on-site.
 - 2) Do not smoke except in authorized areas.
 - 3) Do not have fires for heating or cooking except in authorized areas.
 - 4) Do not conduct operations without approved Standing Operating Procedures (SOP) and proper supervision.
 - 5) Do not become careless by reason of familiarity with ammunition.
 - 6) Do not conduct explosive operations during electrical storms, sandstorms, dust storms, or snowstorms.
 - 7) Do not conduct explosive operations between sunset and dawn.
- d. A records search should indicate the possibility of encountering foreign UXO, ordnance containing toxic chemicals, or experimental ordnance on the work site. Remember that some foreign UXO has been returned to the United States for exploitation, test firing, and disposal. If the records search indicates that UXO containing military toxic-chemical agents may be on the site, a decontamination plan shall be approved prior to entry onto the site. If a chemical UXO is encountered, the two-man concept is immediately implemented and notification shall be made through proper channels. UXO personnel shall immediately establish and maintain security of the UXO and the immediate vicinity until military authorities arrive and assume custody.

- e. In dealing with an unknown type of ordnance, past experience, conditions of delivery, and probable or obvious targets will usually provide a clue as to type. However, considerations should include:
 - 1) The most hazardous type it could be.
 - 2) The most hazardous features it could contain.
 - 3) The most hazardous condition it could be in.
- f. Make every effort to identify the ordnance before performing any procedures. However, do not move the item in order to inspect it unless absolutely necessary, and then move it using remote means. Remotely conduct any initial movement or jarring of a possibly hazardous munition or item.
- g. Care must be observed in probing for, moving, and handling UXO. Do not depress plungers, turn vanes, or rotate spindles, levers, setting rings, or other fittings on the ordnance.
- h. Do not disassemble or subject any UXO to unnecessary movement, except in response to a valid requirement.
- i. Personnel preparing to work on possible live ordnance that could contain electrical elements shall momentarily ground themselves before touching the ordnance.
- j. The site shall be surveyed for electromagnetic radiation (EMR) radio frequency (RF) transmitters, and appropriate action shall be taken. Safe distances have been established for specific transmitter power and transmitters. These distances shall be made available to the contractor by CEHND-ED-SY, upon request.
- k. Do not take magnetic tools or equipment near an unidentified object until it can be absolutely determined that the object is not magnetically functioning.
- l. Do not wear outerwear or undergarments made of wool, silk, or synthetic textiles such as rayon and nylon while working on UXO. These materials can generate sufficient static charge to ignite fuels or initiate explosives. Any person coming in contact with a UXO shall ground himself prior to touching electrical explosive devices (EEDs). This must be done to discharge any electrostatic charge accumulation from the body.
- m. Consider explosive ordnance which has been exposed to fire as extremely hazardous. Chemical and physical changes may have occurred to the contents, rendering it much more sensitive.
- n. Avoid inhalation of and skin contact with smoke, fumes, and vapors of explosives and related hazardous materials. Do not get in the smoke of burning explosives, including solid propellants. The smoke will penetrate ordinary clothing. Severe dermatitis, as well as eye and respiratory irritation, can result. If the smoke cannot be avoided, wear protective clothing and a SCBA. Wear gloves and wash thoroughly with soap and water as soon as possible after handling unknown explosives and propellants and known toxic explosives and propellants.
- o. Do not ingest any explosive material; most are poisonous if taken internally. Do not inhale the gaseous products of high-explosive detonations (certain types of gases produced are poisonous).
- p. Do not subject any explosive-loaded item of ordnance to shock or rough handling.
- q. Protect explosive-loaded ordnance and explosive-loaded components from extremes of heat, including the direct rays of the sun.

- r. Do not carry explosives or explosive components in pockets or elsewhere on the body, unless in special containers designed and approved for this purpose.
- s. Do not permit smoking products (i.e, cigarettes, cigars, pipes, etc.), matches, or other sources of fire or flame within 100 feet of an area in which explosives or explosive-loaded ordnance is being handled.
- t. Exercise extreme caution in dealing with old, damaged, and possibly deteriorated explosive-loaded ordnance. Certain explosives, notably picric acid and ammonium picrate, may react with metals, other explosives, air, or chemicals in the earth to produce extremely sensitive explosive compounds.
- u. Do not rely on the color coding of UXO for positive identification of contents. Munitions having incomplete, improper, or no color coding have been encountered.
- v. Assume a practice UXO contains a live charge until it can be determined otherwise.
- w. Avoid the area forward of the nose of a munition until it can be determined that the item is not a shaped charge, high explosive anti-tank (HEAT) UXO. The explosive jet can be fatal to great distances forward of the longitudinal axis of the item.
- x. Assume any shaped charge munition to contain a piezoelectric (PZ) graze-sensitive fuzing system until the fuzing is otherwise identified. A PZ graze-sensitive fuze is extremely sensitive. It can fire at the slightest physical change, and may remain hazardous for an indefinite period of time.
- y. Anticipate a detonation when burning any explosive. Certain low explosives, such as black powder, casting powders, and solid propellants having a nitrogen content, can react under certain conditions with a violence approaching a high-order detonation.
- z. Civil War projectiles shall be treated as any other UXO, especially projectiles with uncut Bormann time fuses and projectiles with percussion fuses (brass in particular). These have generally provided a watertight seal, even if they have been in the ground over 100 years. No projectile should be exposed to excess heat. The ignition point of black powder, used as a bursting charge in all Civil War projectiles, is 457 °F. Under no circumstances should an attempt be made to drill a hole in a projectile, either through the fuse or through the body of the projectile.

3.0 EXCAVATION OF UNEXPLODED ORDNANCE

- a. The usual method for uncovering buried UXO is to excavate by hand. Hand excavation is the most reliable method for uncovering UXO; however, unless the UXO is very near the surface, hand excavation exposes more people to the hazard of detonation for a longer period of time than any other method.
- b. Earth moving machinery (EMM) may be used to excavate for buried UXO, if the UXO is estimated to be deeper than 12 inches. EMM shall not be used to excavate within 12 inches of an UXO. When excavation gets within 12 inches of an UXO, hand excavation shall be used to uncover the UXO.
- c. Excavation shall comply with the provisions of 29 CFR 1926 Subpart P.

- d. Perform initial movement of an embedded projectile remotely. First movement of an embedded projectile may cause fuze functioning. During this remote operation, precautions shall be taken for a high-order detonation.
- e. UXO, which penetrates the earth to a depth where the force of the explosion is not enough to rupture the earth's surface, forms an underground cavity called a camouflet. Camouflets will be filled with the end product of the explosion, carbon monoxide gas. Camouflet detection and precautions must be considered if records search indicates the site was used as an impact area.

4.0 SAFETY PRECAUTIONS FOR FUZES

- a. Before any movement of a UXO, the fuze condition must be ascertained. If the condition is questionable, consider the fuze armed. The fuze is considered the most hazardous component of UXO, regardless of type or condition.
- b. Observe magnetic and acoustic precautions when approaching an unidentified fuze.
- c. Avoid any unnecessary movement of an armed fuze. Perform any initial movement of an armed fuze remotely and avoid any unnecessary movement of an armed fuze.
- d. Do not disturb a piezoelectric firing crystal in any way.
- e. When transporting a possible armed fuze, position the fuze in the most neutral orientation possible.
- f. Do not subject a mechanical time fuze to any unnecessary movement.
- g. Do not attempt to reset an adjustable-clockwork fuze.
- h. Do not turn off or turn on any source of radio frequency or any rapidly alternating electric current in the vicinity of a known or suspected proximity (VT) fuze.
- i. Do not approach a proximity (VT) fuze until the prescribed waiting period has elapsed, and then approach from the rear.
- j. Keep a fuze which has been removed from ordnance separated from other explosive ordnance.

5.0 PRECAUTIONS FOR PYROTECHNICS AND INCENDIARY MUNITIONS

- a. Protect the eyes using number six shade welders goggles, or equivalent, if visual exposure to burning pyrotechnic material is probable.
- b. Use sand to smother incendiary fires. Water may induce a violent reaction or be completely ineffective.
- c. Bury the incendiary-loaded munitions in sand when transporting. This will smother any fire that may start until other corrective action can be taken.
- d. Anticipate a high-order detonation when burning pyrotechnic or incendiary-loaded ordnance.
- e. Do not approach a pyrotechnic or incendiary ordnance burn for 30 minutes after cessation of burning.

- f. Do not attempt to dispose of photoflash munitions by burning.
- g. Do not look directly at photoflash munitions during disposal operations.
- h. Photoflash powder is extremely sensitive, as it contains black powder and aluminum.
- i. Use oil or WD-40 to desensitize spilled photoflash powder.
- j. Do not manually remove fuzes from munitions containing photoflash powder.
- k. Beware of photoflash powder, which generates hydrogen gas when exposed to moisture.
- l. Beware of expended pyrotechnic/practice devices, which may contain red/white phosphorus residue. Due to incomplete combustion, red and WP may be present and reignite spontaneously if subjected to friction, or if the crust is broken.
- m. Observe extra care when uncovering a buried UXO if a records search indicates WP munitions were fired or destroyed in the area. A buried WP munition may be damaged and, when exposed to air, may start burning and detonate. An ample supply of water and mud shall be immediately available if excavation reveals a WP UXO. Appropriate protective equipment and first aid shall also be immediately available.
- n. Do not approach a smoking WP UXO. Burning WP may detonate the burster or dispersal explosive charge at any time.
- o. Do not transport a WP munition, unless it is immersed in water, mud, or wet sand.
- p. Do not detonate WP UXO into the ground. The UXO shall be counter-charged on the bottom center-line.

6.0 SAFETY PRECAUTIONS FOR AIRCRAFT HAZARDS AND ASSOCIATED MUNITIONS

- a. Turn off aircraft power prior to working on any munition or hazard still attached to the aircraft.
- b. Ensure that the aircraft and all personnel are properly grounded before operations on any ordnance attached to an aircraft.
- c. Always consider a dispenser to be loaded. The presence or absence of a payload may not be obvious from an external examination.
- d. Do not remove munitions from a dispenser unless absolutely necessary. Many of the contained munitions are designed to arm as soon as they leave the dispenser.
- e. Approach and work on unfired rocket and missile motors from the side. Do not expose electrically fired rocket motors within 150 feet of any exposed electronic transmitting equipment or exposed antenna leads.
- f. Observe liquid-fuel and liquid-oxidizer precautions when approaching an unidentified guided missile until monitoring has been verified that the missile does not contain these hazards.
- g. Do not disconnect or cut any electrical cable unless it is specifically prescribed in the EOD procedure.

- h. Beware of high voltage, thermal batteries, wet-cell battery acid and high-pressure lines.
- i. Always approach an aircraft involved in an accident at a 45° angle from the rear.
- j. Some practice bombs do not contain any positive safety features. Positively identify and review all safety precautions prior to handling practice bombs.

7.0 SAFETY PRECAUTIONS FOR GROUND-LAUNCHED AND EMPLOYED MUNITIONS

- a. All munitions that have been fired, launched, thrown, placed, etc., will be considered armed.
- b. Permit only one man at a time to work on a mine.
- c. Consider an emplaced landmine armed until proven otherwise. Many training mines contain firing-indicator charges capable of inflicting serious injury.
- d. Exercise care with wooden mines that have been buried for a long time. Because of soil conditions, the wood deteriorates and the slightest inadvertent pressure on top may initiate the fuze.
- e. Probe and examine carefully the ground around a mine before starting to work on it.
- f. Be constantly on the lookout for booby traps.
- g. Before lifting a mine, neutralize all fuzes and remove the mine remotely.
- h. Always assume a mine to be protected by other mines, anti-lift devices, and other booby traps.
- i. Do not cut or pull a taut wire; never pull a slack one; look at both ends of a wire before you touch it.

8.0 RENDER SAFE PROCEDURES AND DISPOSAL OF UNEXPLODED ORDNANCE

- a. The preferred and safest method for disposal of UXO is to destroy it in its original position by detonation, and this method should be used whenever considerations and circumstances permit.
- b. No UXO shall be destroyed until it has been positively identified. Make every effort to identify the UXO. Carefully examine the item for markings and other identifying features such as shape, size, and external markings. However, do not move the item to inspect it. If an unknown UXO is encountered, photographs shall be taken and express-mailed to CEHND-ED-SY (or other appropriate governing agency), which has access to the TM 60-Series publications.
- c. If the situation dictates, protective measures to reduce shock, blast, and fragmentation damage shall be taken. Army Technical Manual (TM) 5-855-1,

Fundamentals of Protective Design for Conventional Weapons and associated software program "CONWEP" contains data on blast effects, ground shock, cratering, ejecta, and fragmentation.

- d. Consideration shall be given to tamping the UXO to control fragments, if the situation warrants.
- e. Coordination with the appropriate airspace representative shall be conducted and the appropriate notification procedures arranged.
- f. A post-search of the detonation site shall be conducted to ensure a complete disposal was accomplished.
- g. Do not pack a bomb-fuze well with explosives unless it can be positively confirmed that the fuze well does not contain any fuse components.
- h. If UXO must be transported off-site for disposal, state and local laws and the provisions of 49 CFR 100-199 shall be followed.
- i. If base-ejection type projectiles must be transported to a disposal area or collection point, the base shall be oriented in the rear of the vehicle and the projectile secured in the event the ejection charge functions in route.
- j. If an UXO with exposed hazardous filler (e.g., HE, etc.) has to be moved to a disposal area, the item shall be placed in a heavy-duty plastic bag to prevent migration of the hazardous filler. Padding should also be added to protect the exposed filler from heat, shock, and friction.
- k. Do not undertake the handling or disposal of liquid propellant fuels or oxidizers if not familiar with the characteristics of the material.
- l. Inert ordnance will not be disposed of or sold for scrap until the internal fillers have been exposed. Heat generated during a reclamation operation can cause the inert filler, moisture, and air to expand and burst sealed casings. Venting or exposure may be accomplished in any way necessary to preclude rupture due to confined pressure.